ELECTRICAL WORLD

JANUARY 10, 1931

McGraw-Hill Publishing Company, Inc.

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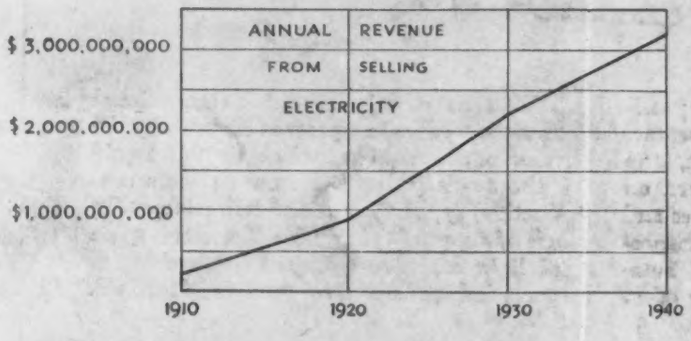
JAN 13 1931

The utilities are now entering the billion dollar decade–



Industry and the homes are fairly well lighted.

Motors have replaced mechanical power where force or motion is required.

Yet the annual revenue from electricity sales is expected to increase from $2,200,000,000 in 1930 to $3,200,000,000 in 1940.

The answer is largely the development of electric heating equipment and processes.

The new things in the home and in industry belong to electric heat.

In the home, the range, the water heater, the off-peak house heating are the center of interest.

In factories it is electric treating of metals, electric forging and annealing, electric heat for chemical processes, electric melting of alloys.

Electric heat offers equal opportunity in the 1930 to 1940 decade that the lamp and the motor offered in the past.

F. L. Driver

PRESIDENT
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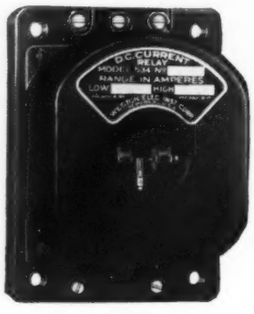
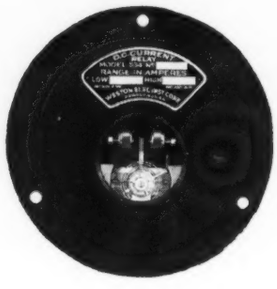


Model 534
Surface Type

Model 30

Model 534
Flush Type



INDUSTRY and Science abound with possible applications of Photo Cell apparatus. They are already being used to start, stop and control the speed of motors, turn on large electric signs as night approaches and off at dawn, to regulate and analyze processes, to sort and count units and automatically regulate and control many other operations.

In the majority of applications, the efficiency and reliability of the Photo Cell apparatus depends upon the reliability of the Relay which transforms the minute electrical impulses into action-producing electrical energy.

Weston D.C. Relays have been used for the past thirty years with outstanding success for automatically controlling voltages and currents. With the advent of the Photo Cell, Weston Relays have come into new prominence. Their reliability of operation and exceptional sensitivity make them ideally suited for many Photo Cell applications.

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Both models may be operated as Galvanometers (zero center), Constant Current or Low and High Current Relays.

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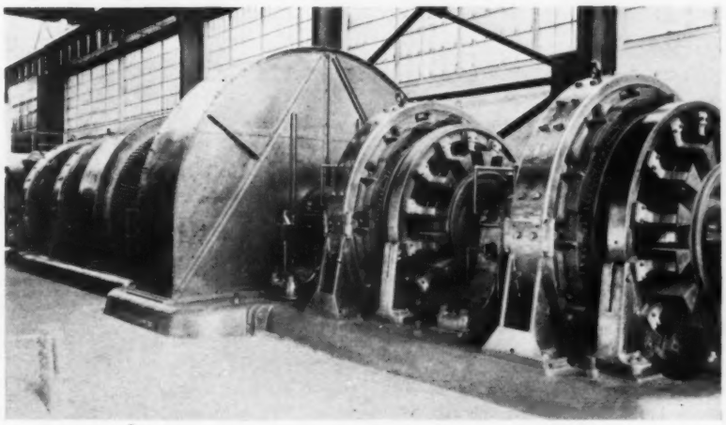

10,400-kw. motor-generator set for steel mill drive

JANUARY 10, 1931

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VOLUME 97 . . . NUMBER 2

News of the Industry 81

Load Factors Await Domestic Load Building 92

1931 Looks Like a Good Year 99
By JOHN E. ZIMMERMANN, *United Gas Improvement Company*

Latest Data on 1,250-Lb. Gilbert Station 100
By E. M. GILBERT, *W. S. Barstow & Company*

A.C. Network Adopted for Toledo 106
By A. HOEFLE, *Toledo Edison Company*

Mobile-Color Floodlighting 112
By KARR PARKER, *McCarthy Brothers & Lord*

Editorials 89

Arrester Developments Alter Installation Practices 98

Scope of Utility Regulation in Different States 102

Substation Standardized for Small Industrials 103

Give Dealers Profit, to Build Central Station Load 104

Federal Trade Report Shows More Interstate Energy 105

Circuit and Meter Identifications Required 105

Neon Tubes Make Inexpensive Ground Detector 110

Mercury Turbine Averages 10,310 B.t.u. per Kw.-Hr. 110

Dead-End Stress Divided Among Ten Insulator Strings . . 110

Porcelain Condenser for Carrier-Current Coupling 111

Non-Extraction Raises Capacity 20 per Cent 113

Financial and Statistical 117

New Equipment Available 124

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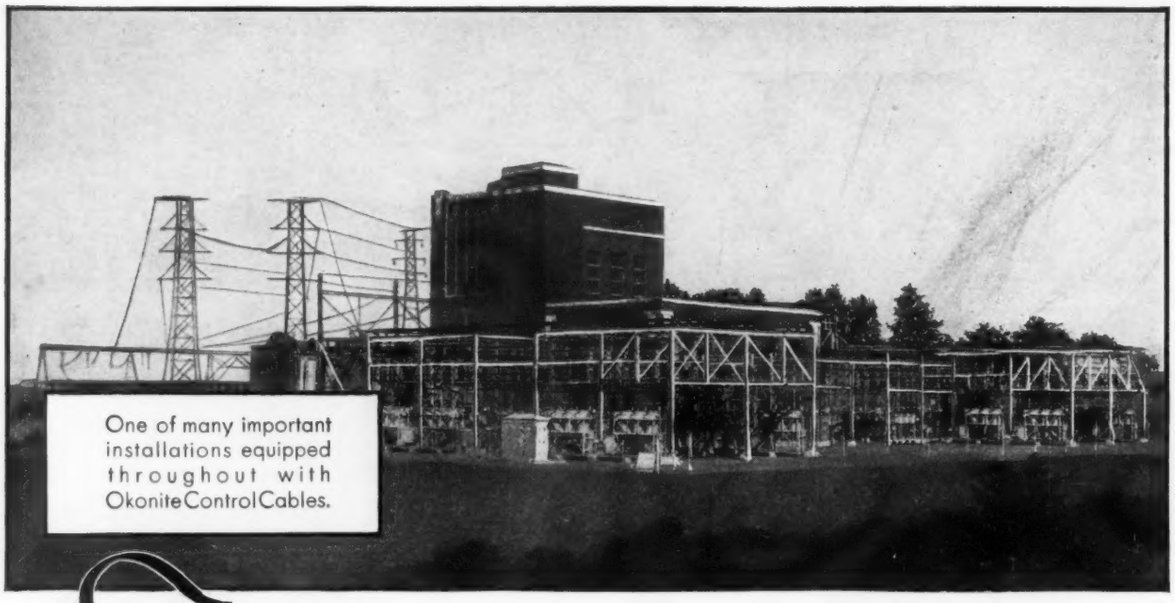

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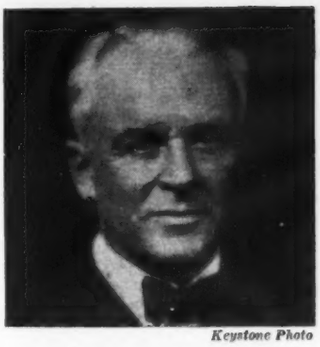
ELECTRICAL WORLD

for the Week Ending

January 10, 1931

St. Lawrence board submits new plan for power development

Muscle Shoals and Power Commission await early action



Keystone Photo

If Sir James Jeans prefers to hold one view and I another . . . no one can say us nay. The one thing of which you may be quite sure is that neither of us knows anything about it.

ROBERT A. MILLIKAN,
Scientist, physicist, astronomer

—**Washington rates protested,** but Potomac Electric Power points to 4.2-cent rate as one of lowest in country. Consent decree provides for division of profits with consumers. People's Counsel is the objector—*p. 82*

—**Roosevelt and power problem** again to the fore as New York's Chief Executive once more urges cheap universal service and the elimination of what he recognizes as power company abuses—*p. 83.*

—**New plan for St. Lawrence** favors one dam to be constructed in two steps near Massena, N. Y., hoping thus to meet Canadian objections to previous proposal and save $60,000,000—*p. 82.*

—**Toledo adopts a network plan** to secure continuous service, flexibility and ease of expansion, and economy in investment and operation. Six plans considered before adoption—*p. 106.*

—**1931 looks like a good year** to U.G.I. head. John E. Zimmermann senses opportunities for construction economies, improved public relations and better holding companies as well as good business—*p. 99.*

—**More high-pressure data out.** This time facts apply to the 1,250-lb. Gilbert station. Operating experience still shows little trouble due to high temperatures or pressures—*p. 100.*

—**System load factors steady** during past decade in many instances. Promotion of range and water-heater installations would bring 10 per cent improvement. Metropolitan areas show gains even though slight—*p. 92.*

—**Profits needed to push sales,** is conclusion of Northwest sales manager. Local dealers must be encouraged to sell appliances if results are to be satisfactory, his plea—*p. 104.*

St. Lawrence Engineers Favor One-Dam, Two-Step Plant at Massena

DEPARTING both from the one-stage, single-dam, 2,326,000-hp. hydro-electric development of the St. Lawrence River at the foot of Barnhart Island favored by the American section of the Joint International Board of Engineers in 1926 and the double-stage, two-dam plan recommended by the Canadians, involving the generation of 406,400 hp. at Ogden Island (this site being in 1929 changed to Crysler Island) and 1,808,600 hp. at Barnhart Island, the engineering board of the St. Lawrence Power Development Commission has just reported to that body that it favors a third method of procedure which it calls "an original engineering plan for developing, cheaply and safely, approximately 2,000,000 hp."

This plan contemplates a one-dam, two-step, 85-ft.-head development at Massena Point, N. Y., farther down stream than any of the sites previously chosen, which the New York engineers maintain "will cost less than any plan heretofore considered, will produce more power, can be constructed in less time, will flood a minimum of land and will eliminate the more serious hazards of construction by building power house and spillway on what is now dry land." Total cost is estimated at $171,547,000, as against $213,000,000 for the former American plan, exclusive of navigation works, and $231,129,000 for the Canadian plan, also exclusive of navigation works. The two former plans put the cost of the navigation works at $22,000,000 and $33,481,000 respectively. In the new plan these works are estimated to cost $50,000,000.

The engineering board thinks that the Canadian objections to the single-stage plan have been met in that the plant will be built in two steps and that less land will be flooded. It is also pointed out that with only a 50-ft. head 600,000 hp. can be developed at an estimated cost of $80,000,000, or $133 per horsepower, and that by raising the dam later to 85 ft., at an additional cost of $90,000,000, an output of 2,200,000 hp. will be possible at a construction cost per horsepower of slightly under $78.

Plant possible in six years

It is estimated that the recommended development could begin turning out power in not less than five nor more than six years from the beginning of actual construction. There would be little difference in the time required for the first step and that which would be consumed in building the completed project as a unit. Approximately a year would be consumed in preparing plans and letting contracts.

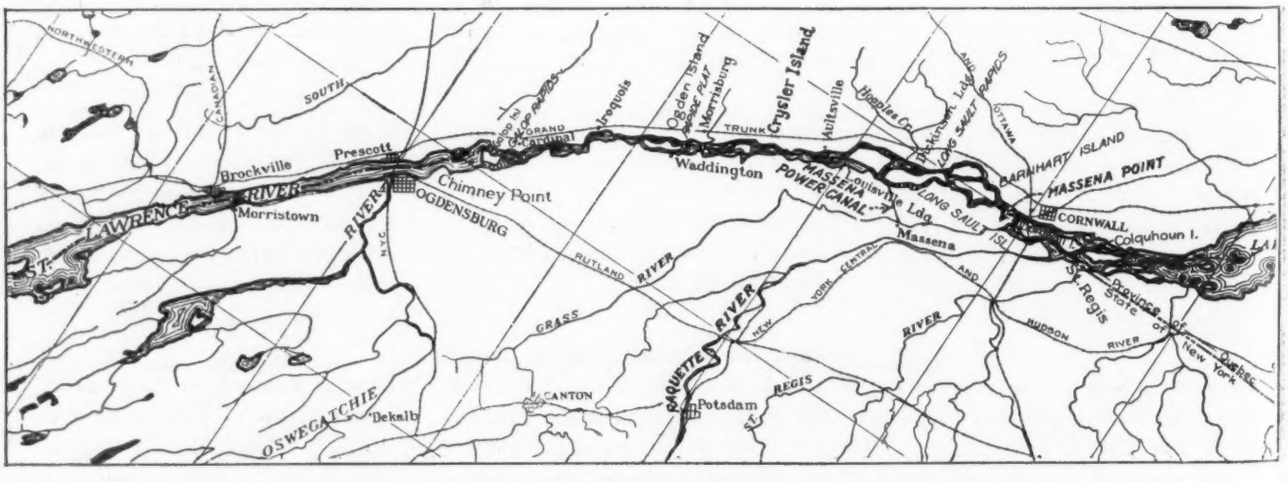
The engineering board of the St. Lawrence commission consists of Lieut.-Gen. Edgar Jadwin, former chief U. S. A. engineers; Oscar G. Thurlow, Birmingham, vice-president Allied Engineers, Inc.; Silas H. Woodard, New York, consulting engineer, and State Superintendent of Public Works Frederick Stuart Greene. The St. Lawrence commission itself expects to make its report public on January 15.

Agreement Reached on Washington's New Rates

AFTER MUCH CONTROVERSY, due in large measure to the insistence of People's Counsel R. B. Keech that the profits of the Potomac Electric Power Company have been much more than the 7½ per cent on which by agreement between the company and the Public Utilities Commission of the District of Columbia an annual rate readjustment is based, the commission has ordered a reduction from 4.7 cents to 4.2 cents per kilowatt-hour in domestic lighting rates with corresponding reductions in separately metered and commercial schedules. The new rates are virtually those offered by the Potomac company.

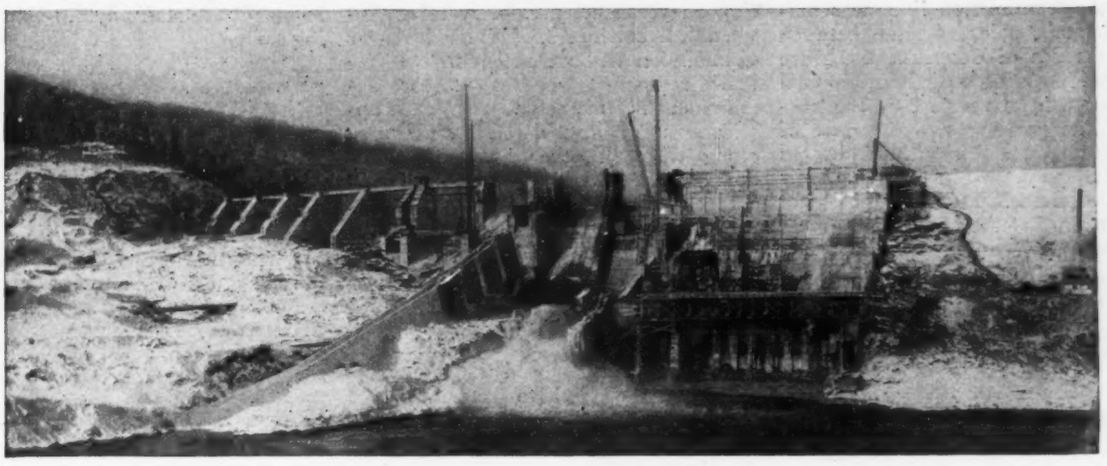
Under the consent decree in force for the last six years the company cuts its rates at the beginning of each year by an amount equivalent to one-half its earnings over 7½ per cent. The commission now announces its intention of seeking by conference with company officials a readjustment of the decree, inasmuch as the company admittedly earned 10 per cent in 1930 and will, it is contended, do as well in 1931. Suggestions that three-quarters instead of one-half the excess earnings be the sum deducted from rates in the year following the accrual, and also that rates be adjusted every six months instead of annually, have been made.

The Potomac Electric Power Company, on its part, maintains that, inasmuch as its rates are already among the lowest in the country and its prosperity is due to good management, good customer relations and the absence of public agitation, it has earned all that has come to it.



International section of St. Lawrence River, showing Massena Point, where it is now proposed to dam the river; Barnhart Island, the site previously favored, and Crysler Island, where the Canadian engineers proposed to build the upper of the two dams they have favored.

WYMAN DAM NOW SPANS THE UPPER KENNEBEC AT BINGHAM, ME.



This photograph of the Central Maine Power Company's dam, eventually to develop 100,000 hp., was taken December 22, just a week before the first unit was placed in service.

▼ ▼ ▼

Power and Regulation in State Legislatures

FORTY-THREE of the 48 state legislatures hold sessions in 1931, including the five that meet annually, 37 of the 42 that meet biennially and the quadrennial parliament of Alabama. In many of the legislatures, which with one exception convene in January, questions concerning power production and utility regulation will come up, and in some of the states these questions will bulk large, as they have done before. Already the opening guns are heard.

NEW YORK.—Governor Roosevelt in his annual message, delivered on January 7, referred to the coming report of the St. Lawrence River commission, deplored the non-action of the 1930 Legislature on the reports of the commission of inquiry which studied the law concerning regulation of utilities, and repeated his own well-known views on this matter, saying in part:

"Regulation of monopolies for centuries under common-law principles and under the theory of the original Public Service Commission law was based on the underlying principle that these utility companies should furnish fair service at reasonable rates. That purpose in many cases has been thwarted. In some cases rates are too high; profits are beyond any reasonable return on investment; service is not always satisfactory—the plain truth is that effective regulation as contemplated originally has not been realized.

"The problem is not confined to the state alone. It is nation-wide. As a result of a long course of judicial decisions and of newly invented methods of financing, the householders and business men of the nation, in a great many cases, must now pay exorbitant rates, measured not in terms of reasonableness for legitimate investors, but rather in terms of speculative profit. . . .

"I remain of the opinion that the proposals of the minority of the commission last year which were rejected by the last Legislature will go far to meet the immediate problem effectively. The housewives of many parts of the state look to us for relief from rates so high as to deprive them of the advantages of modern science to release them from household drudgery.

"The ever-growing public demand for more effective regulation should be met promptly. It would be a fine thing if you and I, serving a common master —the people of the State of New York—would unite in this common purpose of bringing into the homes and stores and factories of our state these modern utilities at a cost reasonably consistent with a fair return to the legitimate investment in these corporations."

CONNECTICUT.—Governor Cross in his inaugural message on Wednesday recommended legislation to increase the power of the Public Utilities Commission over rates of light and power companies by authorizing it to begin proceedings on its own motion instead of being required to wait for a complaint.

INDIANA.—Election of members of the Indiana Public Service Commission by the voters of the state instead of their appointment by the Governor is provided for in a bill to be introduced. The measure would cause the election of one member of the commission from each of the five Supreme Court districts into which the state is divided. Little has so far been heard of agitation to abolish the commission such as has been rife in former days.

OREGON.—Assembly bills to come up authorize a larger fee for water-power permits, the reorganization of the Public Service Commission, the abolition of that department, and authorization for the state to exercise the same advantages enjoyed by ports and municipalities in the matter of exercising the right of recapture of electric utilities under the 50-year private ownership clause.

PENNSYLVANIA. — Legislators from all sections of the hard-coal field have reached an agreement to sponsor an important change in the Public Service Commission rules even if Governor-elect Pinchot fails in his attempt to oust the board and set up one differently constituted. The proposed change in the law will provide that no utility company can put an increased tariff into effect until it has received the approval of the commission. Under the present regulations all a utility company must do is to give notice of an increase.

▼

Muscle Shoals Conferees on Road to Agreement?

CONGRESSIONAL HARMONY over Muscle Shoals seems nearer. In agreeing on Wednesday to the construction of publicly owned transmission lines, the conferees on the deadlocked bill disposed of what was regarded as the main point of dispute between the House and the Senate. It was agreed that the commission that is created by the Norris bill shall be permitted to use the proceeds

derived from the sale of power to construct transmission lines.

While the question of the construction of the transmission lines was perhaps the main point at issue between the two houses of Congress, there are other matters to be settled before final agreement can be reached by the conferees. The provisions of the lease of the nitrate plant will have to be drafted before the conferees can report to their respective houses. Moreover, it is not at all certain that the House will accept the conference report or that the President would sign the measure in the event that it should receive the approval of Congress.

▼

Attack on Power Board Begun by Senator Walsh

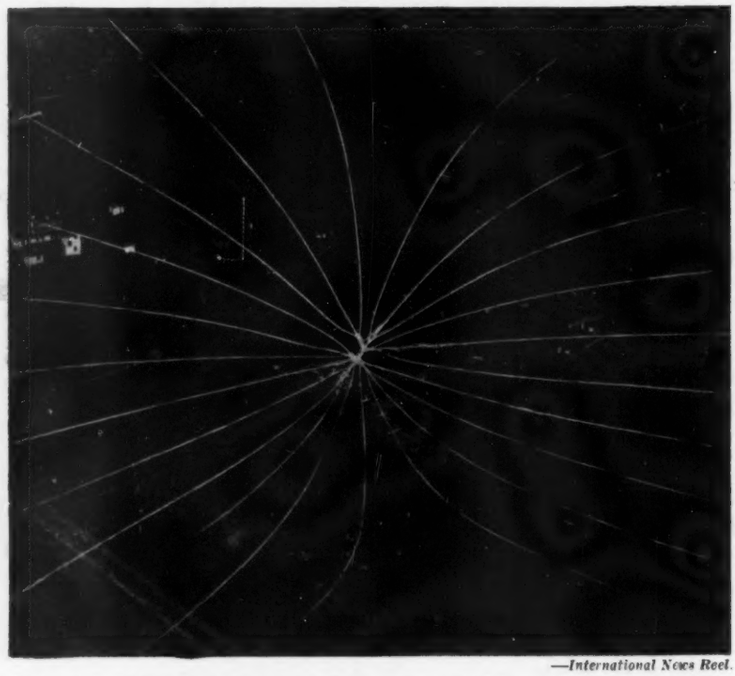
THE EXPECTED STORM in the Senate over the action of the new Federal Power Commission in notifying the executive secretary, the solicitor and the chief accountant of the predecessor board that their applications for re-employment were not desired broke promptly on Tuesday, Senator Walsh of Montana taking the lead. The situation at the commission's offices remained the same except for a resolution adopted at a full meeting of the commission on January 2. This resolution, after reciting the action on personnel previously taken, invited "all employees of the old Power Commission without exception" to "file their respective applications for appointment by this commission, such applications to be considered in due course along with all other applications for appointment filed with the commission." The commission's new expression was interpreted in various ways, some seeing in it evidence of a change of front by the three members who took the original action and predicting the re-employment of Messrs. Russell and King or perhaps of King but not Russell.

Senator Walsh moved that the President be requested to return to the Senate that body's confirmation of Commissioners Smith, Garsaud and Draper. A debate on the constitutional right of the Senate to make the request ensued, with Senator Goff of West Virginia strongly contesting it. No vote had been reached as the ELECTRICAL WORLD went to press, but it was thought possible the motion might prevail. If it does, a long-drawn-out constitutional struggle may ensue.

A letter from Chairman Smith put in the record said that Bonner, Russell and King had been treated exactly alike and that the end sought was "to stop immediately the internal strife which has made the staff anything but a working body."

▼ ▼ ▼

DOES LIGHTNING LOOK LIKE THIS FROM ABOVE?



—International News Reel.

A Dallas "Morning News" photographer, flying over Mensley Field, had his camera pointed down just as a lightning bolt was discharged below it. On developing the plate the above design was found, and the interesting supposition was advanced that the lines reproduced converging electric charges.

▼

Canadian Reaction to New St. Lawrence Plans

OPINION AS EXPRESSED in government circles at Ottawa and in the press of eastern Ontario and Quebec municipalities is unfavorable to the proposal of the engineering board of the New York State Power Development Commission for a new method of single-stage power development in the international section of the St. Lawrence River. It is contended that the new recommendations, while involving radical departures from any previous plans, will not meet the objections already raised by Canada. The Canadian section of the International Joint Board of Engineers has recommended a two-stage development with dams at Crysler Island and at Barnhart Island, and in this recommendation engineers of the Ontario government concurred; but even if the federal and Ontario governments were favorable to the single-stage development, it is not at all likely that Quebec would alter its view that two-stage development would be both more economical and more effective.

▼

Power Debate Has No Audience, M. J. Insull Says

NO REBUKE TO the power industry was administered by the electorate last November, "certain politicians, journalists and college professors" to the contrary notwithstanding; moreover, "there does not appear to be any general public interest in what certain politicians and cloistered experts call the 'power problem.' In fact, it does not seem to exist except in their minds and, because of them, in the minds of electric power executives."

This opinion was expressed to press representatives in Chicago this week by Martin J. Insull, president Middle West Utilities Company, who added that evidence obtained by him indicated that "the politicians and the academic experts on one side and the electric light and power industry on the other are carrying on a debate without an audience." It would be more patriotic, Mr. Insull remarked, "if those of us who are doing the arguing gave our time and thought to solving economic and social problems. We might then have an audience—one that would be interested and sympathetic."

McGraw Award Goes to the Late C. T. Hutchinson

SOON AFTER THE DEATH last February of Charles T. Hutchinson, president McGraw-Hill Company of California, the committee of awards for the medal and purse bestowed annually by James H. McGraw for the most outstanding contribution to co-operative effort in the electrical industry received from the Pacific Coast a petition signed by the respective presidents of the electrical associations in that territory and supported by more than twenty letters from Western leaders of the industry asking that the relationship of Mr. Hutchinson to the McGraw-Hill organization, which had previously made him ineligible to receive this award, be set aside and that the honor be awarded to him posthumously. The judges — Charles L. Edgar, S. L. Nicholson, G. E. Cullinan and L. W. Davis, representing respectively the four branches of the industry—acceded to this earnest request and the presentation has just been made to Mr. Hutchinson's widow accompanied by the following citation:

Charles T. Hutchinson, president of the McGraw-Hill Company of California, came into the electrical industry from the mining field in 1922, entering immediately into the activities of all the organized groups of electrical men on the Pacific Coast. His genial and appealing personality, his earnestness and sincerity, his sympathetic interest and patient understanding, his frank and helpful friendliness, his sound judgment and wise counsel, his impartial fairness and enduring loyalty, and above all his unfailing whimsical good humor, won him immediately the respect, confidence and affection of men high and low in all branches of the electrical business in the Far West.

His neutral position as an editor and his natural qualities of leadership soon brought him into intimate relationship with the problems and purposes of the power companies, manufacturers, wholesalers, contractors and dealers alike and gave him an unusual insight into their achievements, their responsibilities, their perplexities, their aspirations and their ideals. He became deeply interested and actively engaged in the organized activities of each group and in the co-ordination of these group activities for the advancement of the common interests of the entire industry.

He was made a member of the executive committee of the Pacific Coast Electrical Association, an honorary member of the California Electragists and chairman of the advisory committee of the California Electrical Bureau, responsible for guiding and promoting the development of the electrical market in that state. He was president and chairman of the public policy committee of the San Francisco Electrical Development League and was the originator and chairman of the joint committee for the determination of policy in the interrelationships between branches of the industry, sitting also as a board of arbitration in interindustrial disputes.

In this capacity he was the intermediary between the different branches of the industry, encouraging, restraining and sometimes fighting the battles of their conflicting interrelationships. Finally, just prior to his untimely death, he devised and perfected a plan for unifying the organization, financing and operation of the several groups in California on a broader basis of mutual interest, which has now been established. It was the crowning contribution of a career of service that, through his editorial writings, his personal contacts and his broad association activities, has exerted a profound influence on the progress of electrical development on the Pacific Coast.

For the genius of Charles T. Hutchinson lay not alone in his tireless efforts for harmony and co-operation among the electrical men with whom he delighted to work, but in the expression of a broad, practical philosophy of helpfulness in the daily affairs of business life. He brought a spiritual stimulus to men that widened their vision, strengthened their courage, increased their tolerance and left them richer in character for having known him.

C. T. Hutchinson

In recognition of this outstanding service to the advancement of co-operation in the electrical industry and the impressive petition from leaders of the industry in the Far West that his affiliation with the McGraw-Hill organization be disregarded, the judges have voted to Charles T. Hutchinson, as a posthumous award, the 1930 medal for co-operation and the purse given under the James H. McGraw award, to be presented to Mrs. Hutchinson.

▼

Lincoln Arc-Welding Prize Paper Competition

FOR THE SECOND TIME the Lincoln Electric Company of Cleveland is offering very substantial prizes for papers describing the advantages of arc welding in the redesign of any present product or in the design of any proposed product or structure. Forty-one prizes, totaling $17,500, are offered, as follows: First, $7,500; second, $3,500; third, $1,500; fourth, $750; fifth, $500; sixth, $250; seventh to forty-first, $100 each. The closing date for submitting papers is October 31, 1931. Competition is open to every one except the Lincoln company's own employees. The jury of awards will be composed of the faculty members of the electrical engineering department of Ohio State University, under the chairmanship of Prof. Erwin E. Dreese, head of the department, and such others as he may select.

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Consolidation in Winnipeg? Electric Heat Foreseen Too

WINNIPEG CONTINUES TO BE a source of electrical news from western Canada. Conversations between the city Hydro officials and members of the Nesbitt-Thompson firm which controls the Winnipeg Electric Company are reported in Manitoba dispatches to have brought a conditional proposal from the company to pay $30,000,000 for the city-owned plants. The city has displayed no alacrity in debating the proposal, and, on the other hand, the company has evinced no desire to sell its own property to the municipality.

Negotiations, it is said, may be resumed. In the meantime the Hydro officials announce that a million-dollar addition to the city's central heating plant is in contemplation. This plant now heats 200 city buildings and numerous suburban homes. The statement says that the proposed addition would result in a saving of $100,000 annually. When surplus power is available from the Slave Falls power development it is said to be the hope that the boilers in the plant can be heated by electricity instead of by coal.

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Marion and Other Ohio Plants Go to Insulls

HARRY REID, president of the National Public Service Corporation, an Insull holding company, announces a transfer of properties in Ohio and Pennsylvania between subsidiaries of the Middle West Utilities Company and the United Gas Improvement Company. The transfer gives to Commonwealth Utilities Corporation, a U. G. I. subsidiary, control of the Chester Valley Electric Company, which serves 42 communities near Philadelphia, including Coatesville and Downingtown, and the Kennett Gas Company. From the U. G. I. system the Municipal Service Company will obtain control of the Columbus, Delaware & Marion Electric Company, which sup-

plies light and power in 28 Ohio communities, including Marion, and operates an interurban railway line between Marion and Columbus. This property went to the U. G. I. in October, 1929.

Authority to purchase for $1,912,106 six light and power companies furnishing rural service in five Ohio counties has been asked of the Ohio Public Utilities Commission by the Greenville (Ohio) Electric Light & Power Company, an Insull subsidiary.

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Farm Power Interests Organize in New England

TO FACILITATE HANDLING rural electrification problems by the so-called case method and to afford closer co-operation in development of service, a conference of agricultural and utility leaders was held at Worcester, Mass., on December 30 which resulted in the formation of a New England regional committee headed by F. L. Rimbach of the New England Power Association, with a representative from each state who will establish corresponding state committees to further this work. Sixty conferees were present, and the discussions evinced a new understanding of the economic problems affecting farm power and line extensions.

Samuel Ferguson, president Hartford Electric Light Company and chairman of the farm power committee of the New England Council, advocated a pay-as-you-go development of rural lines. Dr. E. A. White, Chicago, head of the committee on the relation of electricity to agriculture, commended the work of state bureaus in co-operation with the power industry and urged steady development along economic lines. Other authorities spoke on co-operation between power companies and the farming interests.

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Once More the Institute Prepares Winter Program

ACTIVE PROGRESS of modern electrical engineering will be exemplified in papers on telegraphy, transportation, inductive co-ordination, protective devices, power transmission, industrial power applications, welding, research and electrical machinery in ten technical sessions of the winter convention of the American Institute of Electrical Engineers, to be held, as usual, in New York in the last week of January. The technical program in its final shape is printed in condensed form herewith. The annual smoker on Tuesday evening, the presentation of the Edison medal to Dr. Frank Conrad on Wednesday evening and the dinner-dance on Thursday evening are other events.

Institute Program for Winter Meeting

MONDAY, JANUARY 26

Afternoon.—Symposium on Telegraphy: Five papers by Western Union and A. T. & T. engineers.

Evening.—Joint meeting of committee on transportation and New York transportation group.

TUESDAY, JANUARY 27

Morning.—Symposium on Inductive Co-ordination: Four papers, covering research on noise-frequency induction (O. B. Blackwell and H. L. Wills), low-frequency induction (R. N. Conwell and H. S. Warren), joint use of poles (J. C. Martin and H. L. Huber), and trends in practice (W. H. Harrison and A. E. Silver).

Afternoon. — Protective Devices: Seven papers, covering modern circuit interrupters (J. B. MacNeill), breaker tests at Philo station (Philip Sporn and H. P. St. Clair), oil-blast circuit breakers (D. C. Prince and W. F. Skeats), field tests on oil circuit breakers (R. M. Spurck and H. E. Strang), series resistance for increasing transient stability limit (R. C. Bergvall), experimental lighting protector for insulators (J. J. Torrok), and field tests on thyrite arresters (K. B. McEachron and E. J. Wade).

WEDNESDAY, JANUARY 28

Morning. — Power Transmission: Five papers, covering traveling waves (L. V. Bewley), impulse tests on substations (A. S. Brookes, R. N. Southgate, W. G. Roman and E. R. Whitehead), lightning on wooden-pole line (J. J. Torrok and R. R. Pittman), lightning on A. G. & E. 132-kv. lines (Philip Sporn), and attenuation and successive reflections of traveling waves (J. C. Dowell).

THURSDAY, JANUARY 29

Morning.—Industrial Power Applications: Six papers, covering electron tubes (W. R. King), automatic regulators (J. H. Ashbaugh), electrical distribution systems (W. J. McClain and L. T. Klauder), the synchronous motor as a drive for high-torque loads (M. A. Hyde, Jr.), synchronous motors for special requirements (D. W. McLenegan and A. G. Ferris), and "weather making" (D. C. Lindsay).

Afternoon (two sessions). — 1. Transportation: Five papers, covering inclined catenary calculations (B. M. Pickens), Lackawanna suburban electrification (E. L. Moreland), motive power for suburban electrification (Charles Kerr, Jr.), the transverse-fissure detector car (H. C. Drake), and catenary system of Cleveland terminal (N. F. Clement and E. E. Richards. 2. Electric Welding: Six papers by General Electric and Westinghouse engineers and F. Creedy.

FRIDAY, JANUARY 30

Morning.—Research: Seven papers, covering cable oils (H. H. Race), insulating oils (J. B. Whitehead), impregnated paper (J. B. Whitehead and W. B. Kouwenhoven), traffic control by light beams (R. C. Hitchcock), commutation and current collection in hydrogen (R. M. Baker), the helical groove (G. M. Little), and non-linear circuits (C. G. Suits).

Afternoon. — Electrical Machinery: Five papers, covering mercury-arc rectifiers (A. W. Hull and H. D. Brown), effect of transient voltages on transformer design (K. K. Palueff), stationary flow of heat in large generators (C. R. Soderberg), induction-motor slot combinations (G. Kron), and pulling a salient-pole synchronous motor into step (H. E. Edgerton and P. Fourmarier).

Scattered Happenings in the Electrical Sphere

United States

WORK SHOULD BE FINISHED this year on the 64,000-kw. generating plant in Michigan City for the Northern Indiana Public Service Company. The Northern Indiana company and the Interstate Public Service Company have built a 132-kv. transmission line, 82 miles long, from Monticello to New Carlisle, where it connects with a line of the Northern Indiana which runs to the Indiana-Illinois state line, 58 miles distant.

FOUR OF THE FIVE new turbines and generators for the Empire District Electric Company's power plant at Ozark Dam in Missouri have been installed. A new power line will connect the dam with Aurora, Mo., and bring hydro energy into the Joplin district.

A REDUCTION IN THE ELECTRIC RATES of the Interstate Power Company amounting to $36,000 on the estimate for 1931 became effective on January 1. Residence primary rates are cut from 9 to 8.5 cents a kilowatt-hour, and a half cent is deducted from each succeeding step. The flat rate is cut from $4.45 to $4.25. Commercial lighting, small-power, large-user and street-lighting rates are also cut.

AN ELABORATE TABULATION just issued by the Iowa Committee on Public Utility Information shows that in the last eight years 34 towns which had both generating plants and distribution systems and 58 towns which had distribution systems only have gone from municipal to central-station service. Every one of these places, the committee says, has now a lower rate and better service than before the transfer of ownership.

THE SECOND ANNUAL school of lighting practice sponsored by the Southwestern Geographic Division, N.E.L.A., will be held in New Orleans during the early part of February at Tulane University under the joint auspices of Tulane's College of Engineering and the Southwestern Division. Nationally known leaders of the lighting industry will address the classes.

WORK HAS STARTED on the earthen dam of the Dallas Power & Light Company on Mountain Creek, near Dallas. Twelve to fifteen months will be required for completion of the dam, which will be 8,600 ft. long, 225 ft. wide at its base and 16 ft. wide at its crown. The 120,000-kw. power plant is to be erected one unit at a time, the first unit of 30,000 kw. or more to cost approximately $3,000,000. Power will be transmitted to the company's North Dallas power plant.

BUFFALO'S MAIN STREET HAS NEW ARC LAMPS

Main Street, Buffalo, recently installed 124 new street-lighting standards (the gift of business men) at a cost of $33,000. These standards measure 23 ft. from street level to arc centers and are spaced from 90 ft. to 100 ft. apart for 6,438 ft. Each standard is equipped with three 6.6-amp. G.E. luminous-arc lamps fitted with rippled alabaster globes and emitting 50,000 lumens per pole.

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To PROMOTE THE WELFARE of publicly owned gas and electric utilities an organization has been formed under the name of the Publicly Owned Gas and Electric Utility Association of California. Membership will be made up of all the public gas and electric utilities operating within the state, of which there are 24 individual operating groups.

Canada

RATEPAYERS OF SYDNEY, NOVA SCOTIA, have voted in favor of turning over future distribution of electrical energy in the city to the Nova Scotia Light & Power Company of Halifax. A plebiscite on the question of establishing a city-owned distribution system showed 93 in favor and 1,110 against.

TWO AND A HALF MILLIONS will be paid to the Ontario Hydro-Electric Power Commission by the Hamilton local system for the distribution system in that city which formerly belonged to the Dominion Power & Transmission Company.

MORE THAN 1,850 MILES of primary rural lines, in addition to the 7,000 miles already constructed by the Ontario Hydro-Electric Power Commission, are to be erected in 1931. It is estimated that these additional lines will serve more than 9,700 customers and will cost approximately $4,380,000. In November applications for rural service were received from 460 persons, which will necessitate building 149 miles of line at a cost approximately $303,000.

Abroad

THE BOROUGH COUNCIL of Fulham, England, is asking permission from the British Electricity Commissioners to enlarge its power station from 18,000 kw. to 100,000 kw. now and ultimately to 300,000 kw. at a cost of $26,250,000.

THE BIENNIAL CONVENTION sponsored by the Union Internationale des Producteurs et Distributeurs d'Energie Electrique will be held this year in Algiers, April 20 to 24. The usual invitation is extended to American engineers.

A HYDRO DEVELOPMENT on Loch Ericht, a lake in the fastnesses of central Scotland, was put in service on November 30, two years after construction began. It has two turbines rated at 20,000 hp. each. The work involved raising the level of the lake by 13 ft., excavating 2¾ miles of hill tunnel and constructing transmission lines from Rannoch, where the power house is, to Abernethy, near Perth. A beginning has been made on a new dam on the River Tummel below Kinloch Rannoch, involving the erection of a second power house at Tummel Bridge. This is expected to be completed in about two years.

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Utility's Right to Sell Appliances in Nebraska

FINDING A PRECEDENT in a decision of the Pennsylvania Supreme Court affecting the Lancaster Gas Light Company, Attorney-General Sorensen of Nebraska has ruled, in answering an inquiry concerning the right of the Metropolitan Utilities District of Omaha to sell gas heaters, that a municipal or private corporation chartered only to manufacture or sell gas may also merchandise appliances for the use of gas. According to the Attorney General, in the entire United States there appears to be but one legal decision in point—the one by the Pennsylvania Supreme Court just referred to. A similar decision by the same court was handed down last summer permitting the Philadelphia Electric Company to merchandise. (ELECTRICAL WORLD, August 9, 1930, page 242.)

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Coming Meetings

Empire State Gas and Electric Association—Electric conference, Briarcliff Manor, N. Y., Jan. 15 and 16. C. H. B. Chapin, Grand Central Terminal, New York.

American Engineering Council — Annual meeting, Washington, D. C., Jan. 15-17. L. W. Wallace, 26 Jackson Place, Washington.

National Electrical Manufacturers' Association — Midwinter meeting, New York headquarters, Jan. 19-23. A. W. Berresford, 420 Lexington Ave., New York.

American Institute of Electrical Engineers — Winter convention, New York, Jan. 26-30; district meeting, Pittsburgh, March 9-13. F. L. Hutchinson, 33 W. 39th St., New York.

North Central Division, N.E.L.A.—Commercial meeting, Nicollet Hotel, Minneapolis, Jan. 26 and 27; engineering meeting, Minneapolis, Feb. 23 and 24. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

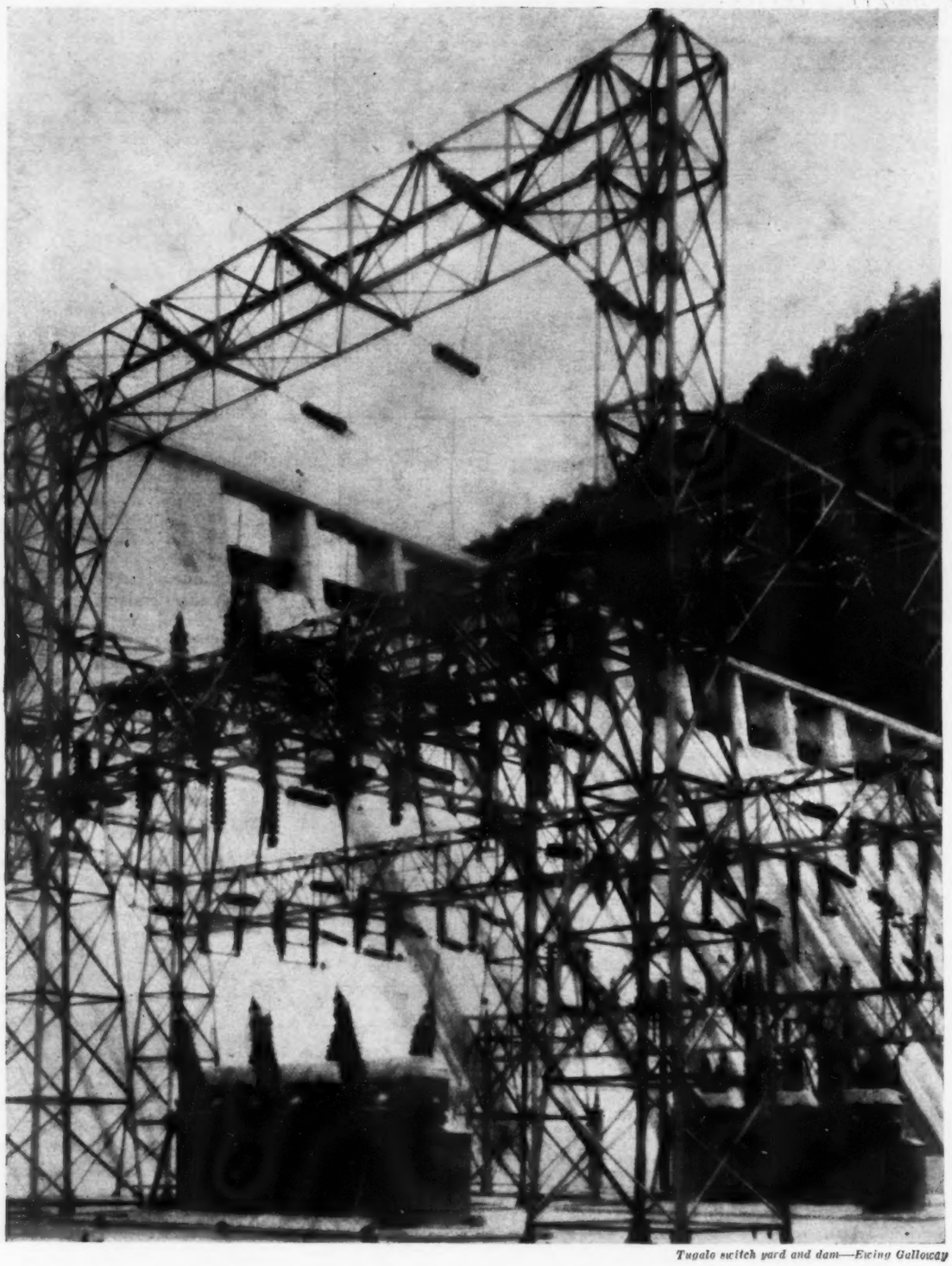
Pacific Coast Electrical Association—Commercial Section, Los Angeles, Feb. 5-6. S. H. Taylor, 447 Sutter St., San Francisco.

Midwest Power Engineering Conference—Chicago, Feb. 10-13. G. E. Pfisterer, 308 W. Washington St., Chicago.

Maryland Utilities Association—Baltimore, Feb. 11-13. D. E. Kinnear, 803 Court Square Bldg., Baltimore.

Oklahoma Utilities Association—Oklahoma City, March 10-12. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

Illinois State Electric Association — Springfield, Ill., March 12 and 13. G. W. Schwaner, 205 Illinois Mine Workers' Bldg., Springfield, Ill.



Tugalo switch yard and dam—Ewing Galloway

Georgia Power Reduces Hydro Lead

Intensive development of the hydro resources of Georgia has been undertaken over a period of years by the Georgia Power Company. In one instance six plants utilize a total fall of 1,199 ft. in an air line of 22 miles, developing 289,420 hp.

Previous to the dedication last October of plant Atkinson, a new 75,000-kw. steam station, the hydro capacity represented 95 per cent of the system total, whereas it is now but 77 per cent. Atkinson plant is planned for an ultimate 300,000 hp.

EDITORIALS

L.W.W.MORROW
Editor

What the figures say of sales

IF THE statistics of last year in the electrical industry mean anything, they mean this to the man who is concerned with building markets: Out of the present 24,702,000 customers of the power companies, 82.8 per cent are residential. These number 20,438,774. Since there are 29,300,000 families in the United States, it follows that there remain somewhere around 9,000,000 homes not yet electrified, of which something under 6,000,000 are rural. Last year, through sales effort, extension of lines and growth of population, 471,620 new residence customers were added. But in the next ten years 5,000,000 more families will have been added to our population. The present rate of increase in central-station customers, therefore, just about equals that of the growth of the country. Also the average annual residence consumption, now only 547, has been increasing at the rate of about 25 kilowatt-hours per year. How, then, will the fuller enjoyment of electricity be made possible by the more general use of complete equipment in the home? How will a larger return per customer be developed in the public service and for the industry?

It is plain from these figures that selling on the present scale will not provide an adequate progress. It gains too slowly upon the natural growth of the market to achieve anything much toward that universal electrification of modern living that has so long been the dream. What can be done? There is but one answer. The industry must face the problems of market development with something more of the spirit that has marked its meteoric progress in construction and operation, where higher voltages, bigger turbines, broader transmission systems and new efficiencies again and again have outsped the imagination of five years back. Selling also will have to find new methods, new policies, new programs, new plans that will break records and set new standards for accomplishment. And this, of course, can be made possible only by an increase in the appropriations and the man power applied to creating markets and to building load.

Another St. Lawrence plan

A NEW plan to develop 2,000,000 hp. from the St. Lawrence at a completed cost of $77.97 per horsepower has been announced by the engineering board of the St. Lawrence Power Development Commission. This plan calls for a one-dam, two-step development at Massena Point, thus differing from both the Crysler Island two-stage plan and the Barnhart Island one-stage plan. Another important difference lies in the location of the project further down the river. The engineering board proposing the new plan consists of General Edgar Jadwin, O. G. Thurlow, S. H. Woodard and F. S. Greene. These names in themselves justify placing a great deal of confidence in the report.

But the St. Lawrence development is surrounded by other than engineering elements. Eastern Canada and central Canada are at loggerheads on the project largely because of anticipated effects on rail and ocean shipments. In this country several groups have selfish interests at stake, and beyond these lies the realm of government, state or private ownership and operation. It is

apparent that, in this time of financial depression, the sectional economic and political factions will delay action on the project for some time. But from the standpoint of the greatest national good to the United States and Canada there is no doubt that both navigation and power facilities on the river should be developed as soon as possible. Selfish group interests should be subordinated.

Put public and private plants on same accounting basis

REGULATION in some quarters shows signs of reversion to a discarded phase of its evolution to the present commission stage. The consuming public originally hoped to rely on competition for assurance of fair rates, but that proved a wasteful and temporary remedy. Now the supplanting form of regulation of non-competitive utilities by commissions has been assailed by politicians, and as a substitute short of full governmental ownership—which they know the nation will not accept—they advocate the entering wedge of governmental competition. Thus utility regulation retraces its cycle.

If the public is cajoled into commitment to the experiment, it will be because the people and their mentors are blind to some unemphasized phases of competition surrounding the utility "monopolies." The latter have to compete with comparable services, compete for the consumer's marginal dollar, for capital, materials, labor and talent, and for public esteem as well as for public patronage. The success attending these competitive efforts influences rates as much as, if not more than, mere physical competition and production efficiency. The private electrical industry is of one mind that in these areas of competition private enterprise will clearly beat the communal effort.

Nevertheless, in spite of the weight of evidence against it, the original form of duplicate physical competition will be tried again in a few new places. Private enterprise will have to contend with it. The contest will show who earns the championship belt. All the present champion asks as a matter of right and fairness is that the gloves be identical, that spurs and fouls be excluded, that the scoring be fair and a decision rendered. Translated to the jargon of utility economics, all this reduces to one stipulation, and that is simply that the municipalities and the states prescribe for their utility undertakings the same accounting formulas and published audits which they have imposed by law and rule upon the private utilities. Only thus will the unprofitableness of arbitrary inversions of rates be revealed, along with the extent to which general tax proceeds have to be drawn upon to offset the operating losses. That is an eminently sound, modest and fair request. The voters should weigh the proposals primarily in the light of the extent to which this is guaranteed.

Rural power advancing in New England

BETTER days have come to rural New England from the electric service standpoint. Sixty leaders in agricultural and power circles met informally at Worcester last week and organized a regional committee to deal with the pressing economic and educational problems which retard more rapid farm electrification. A better understanding of these problems was apparent in the discussions of the group throughout the day devoted to the gathering, and the outlook for service expansion along sound lines is very gratifying. Within the past few years substantial progress has been made by the power companies in extending their facilities into the country districts. Further development is immediately ahead, and, best of all, every move now planned by the leading utilities reflects careful economic study and strengthened friendly relations with representatives of the farm industry.

Hundreds of miles of line extensions and thousands of new farm customers have been added to the New England systems within the past two years alone, and in general this advance has been made with everybody's eyes wide open as to costs and amortization. Promotional rates with energy prices attractive to refrigeration, range and water-heating service have been and are being developed. The economic handicaps of low population density per mile of line, unsuitable rate schedules and small use of service are now being faced courageously by all the groups concerned, and through close co-operation the mutual inter-

ests of the individual farmers and of the power companies are being served. The contacts of these groups enable the applications of farm customers for line extensions to be handled by the case method, and the new understanding of rural service problems resulting from many conferences is stabilizing development. Economically impossible extensions are being tabled through cooperative appreciation of facts, and steady expansion goes forward without fear of any material future losses or abandonment of facilities. Public relations also bid fair to gain much by the setting up of interindustry machinery of this kind.

Multiple underground services

"PUT the wires underground" is a demand that is becoming increasingly prevalent in business districts of cities, large and small. Unquestionably the removal of overhead lines from streets is a move toward the much-desired sightliness; but the cost of change-over is difficult to absorb unless the load density is fairly high, so that even companies which recognize their obligation to improve the appearance of streets cannot meet public demands as fast as they would like.

However, one method has been used to reduce the service-connection costs, which may run as high as $100 apiece, during the transition from overhead to underground service. It consists of bringing out a single riser from the underground system in each block, running what is virtually a secondary extension along the back walls of buildings and tapping off from it a number of services.

Weatherproof wire on brackets or rubber-covered wire in conduit may be used. Of the two, the latter looks better but is more costly. Lately a third method has offered itself. By this method multiple conductor cable is used, each phase conductor being insulated with rubber and the neutral, if present, uninsulated. The combination is belted with rubber tape and covered with cotton braid. The cable may be hung on brackets, like weatherproof wire. It has the clean appearance of a conduit installation and is relatively inexpensive.

Perhaps these expedients will afford some relief from what are sometimes uneconomical investments in underground systems.

Are power systems too elaborate?

IN THE growth of our electric systems a problem has for years been to keep pace in the matter of safety and protection with the growth in size of generation, transmission and distribution systems. At a time like this, when the industry is confronted with need for new markets, many of which can be opened only when and if the cost of electric service is reduced, it may be well to ask a few questions.

Have we gone too far in our search for the perfect system? Have we multiplied emergency supply sources for emergencies that never happen? Have we duplicated feeds for cases where two sources are already in existence? Have we provided dual drives with automatic throw-over features where one is more than ample? In short, have we attained the point where complexity feeds upon itself? If we have, is it not time that we pulled ourselves up before reaching the state so familiarly described in the philosophical quatrain:

> So, naturalists observe, a flea
> Has smaller fleas that on him prey,
> And these have smaller still to bite 'em,
> And so proceed *ad infinitum?*

If, in order to keep up growth, the problem were put to engineers to design and construct a a modern efficient steam-power plant in a non-urban district at $60 per kilowatt, how many would be in position to attempt it with reasonable chances of success? Yet it may very well be that ability to do such a thing may be the one thing that would determine whether certain processes now carried out non-electrically could be converted to electric operation. Perhaps $60 is too low a figure, but what an excellent bogey this would be! And, assuming that such a bogey were accepted, how many of the duplicate features that are now provided in power-plant design could be justified? How many of them would automatically fall by the wayside because, however desirable in themselves, they exceed by five cents or five dollars the limit put on cost per kilowatt and therefore become non-essentials which cannot be afforded?

It is so easy to add just another safeguard to service and so difficult to keep the cost per kilowatt down if a definite check is not made.

Load Factors Await Domestic Load Building

Analysis of typical systems show little load factor change in a decade. Range and water heater offer 10 per cent improvement. Metropolitan system load factors gain moderately

THE daily load characteristics, summer and winter, for the 1924 and 1929-30 seasons reveal only a very moderate amount of improvement in load factor of eighteen representative systems. On the whole, it is a matter of a few per cent. In spite of rates framed to induce loads which would contribute to load factor improvement and in spite of aggressive energy sales activities, relatively little seems to have been accomplished. As a group it is the metropolitan companies which have been most successful in this respect. Undoubtedly it is because they are most favored by available night loads in stores and "white-way" lighting and in concentrated industry with its potentiality for off-peak usage. The unweighted average of their ten-year change in load factor, as reflected by fourteen companies in Table I, is a gain of 3.56 per cent. A similar number of transmission companies, Table II, serving scattered areas with few large cities shows a drop of 0.6 per cent.

Various explanations are offered by utility executives to account for such gain as has been effected other than that attributable to natural improvement in diversity coming with enlarged systems:

Increased use of refrigerators, radios, household appliances.

Development of industrial heating load.

Increased lighting on streets and highways.

Electrification of water and sewage pumping.

Sign and flood lighting.

Domestic night loads, off-peak water heating.

Off-peak industrial loads; resort to peak control by industrial users.

Elimination of demand charges on off-peak loads.

Off-peak energy to central heating plant for steam production.

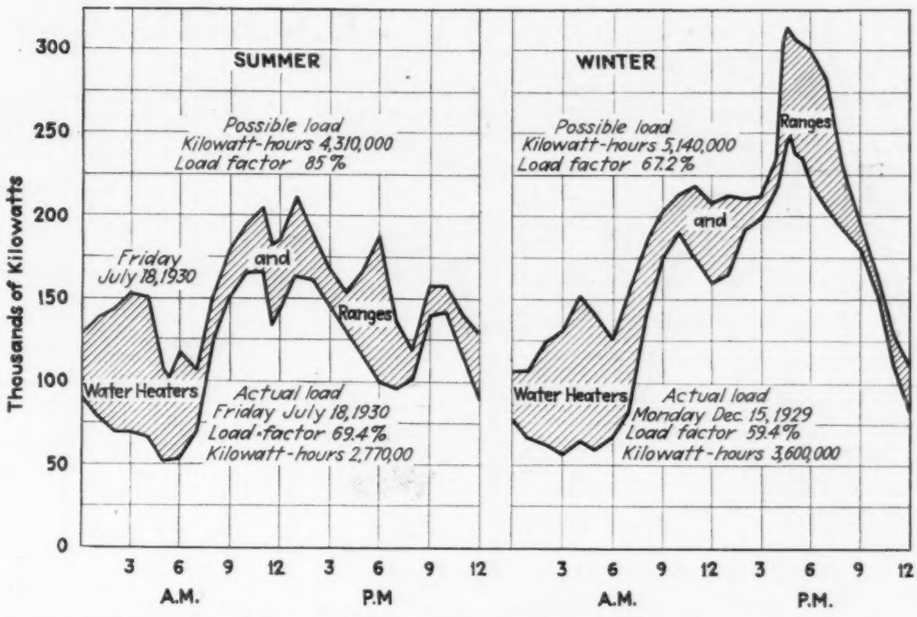
Here are opportunities galore for raising recovery on investment to higher levels through the medium of improved load factor. But there have manifestly been obstacles to a rapid realization of these benefits. An estimate was made by the ELECTRICAL WORLD in 1926 that a national load factor of 66 per cent should be attainable for the residential user equipped with range, refrigerator, water heater, lights and the usual small appliances. This figure is still far from attainment, judging from the extent to which these services are used, and there is little reason to believe that it has passed 30 per cent. Some feel that a large share of the growth and betterment of loads will have to come from the residential user. But man, in spite of his occasional wee-hour activities, is not by nature a nocturnal animal. Off-peak loads will be most successfully acquired among those which work while man sleeps, such as the automatic type developed for home and for industry on intermittent processes with cumulative or storage features.

From one source we learn: "We are constantly seeking higher load factor business and have quoted special rates in a number of instances to prospective users of large blocks of power for high load factor. Incidentally, our standard power schedules all offer low rates to those customers who make the greatest use of their demands. We are pushing our domestic business very aggressively.

Table I—Slow But Steady Improvement in Metropolitan Annual Load Factor

The ratios were computed from the values of system peak and annual output reported by metropolitan companies and published in annual supplements of the ELECTRICAL WORLD. The latest chart was a supplement to the issue of May 3, 1930.

Company	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	Ten-Year Change
1	39.8	39.8	37.8	40.5	38.0	39.3	39.8	42.8	42.6	44.2	+ 4.2
2	44.9	41.8	42.3	47.0	44.4	43.6	44.4	47.1	46.8	52.9	+ 8.0
3	50.9	46.9	42.0	43.8	44.8	44.9	45.0	46.7	47.5	53.6	+ 2.7
4	52.4	50.9	49.8	51.3	49.8	50.8	52.8	55.0	54.7	56.4	+ 4.0
5	40.6	44.0	43.8	43.9	40.8	42.2	42.9	46.0	45.3	47.0	+ 6.4
6	57.1	48.9	46.9	50.7	52.2	49.5	53.6	55.2	55.3	....	— 1.8
7	50.3	45.6	43.4	49.8	44.3	45.7	44.4	44.3	44.1	52.4	+ 2.1
8	42.9	33.4	37.6	39.3	38.5	36.4	40.5	38.1	38.8	42.9	0
9	50.2	43.8	46.8	56.1	51.5	51.1	56.5	54.4	56.4	55.9	+ 5.7
10	56.6	46.1	48.6	51.4	53.2	47.6	57.0	46.4	54.9	55.8	— 0.8
11	45.0	43.8	42.3	42.8	41.4	49.1	51.7	53.7	45.3	47.7	+ 2.2
12	41.5	41.7	44.1	44.0	42.4	43.4	43.7	43.4	43.5	43.5	+ 2.0
13	45.7	43.5	41.6	45.8	49.3	46.8	47.9	56.2	57.0	54.1	+ 8.4
14	48.0	42.4	41.1	49.1	45.5	46.6	46.0	59.1	53.0	53.5	+ 5.5
Unweighted average											+3.56



As a typical example of intensive household use, ranges and water heaters added by half of company C's 280,000 residential customers would represent a revenue gain of $14,000,000 annually from the 1,500,000 kw.-hr. of daily load increment. Summer load factor would rise from 69 to 85 per cent and winter load factor from 59 to 67 per cent. The composite water heater and range load is assumed to have a diversified peak of 600 watts and an annual consumption by each customer of 4,000 kw.-hr. per year at a 2½-cent rate.

8 to 16 per cent gain in load factor from range and water heater

feeling that this load will ultimately have a favorable effect upon our system load factor. At the end of September, 1926, our average consumption per residential customer per year was 376 kw.-hr. and at the end of August, 1930, it was 660 kw.-hr."

Basis may be detected here and there for asserting that real load factor gains have been made. In fact, a company may often claim great credit under certain circumstances for even a 5 per cent betterment of load factor. Thus in one instance a 10,000-kw. load with a factor of 90 to 100 per cent was acquired ten years ago and gave the system a 50 per cent load factor. That load has not changed materially in magnitude or character, and it is therefore now a much smaller portion of the increased system load. Nevertheless, the system load factor has risen to 56 per cent. Evidently considerable improvement must have been effected in the rest of the load to maintain and even improve the ratio in the face of a declining influence of the best contributor.

Undoubtedly a cheaper generation cost is obtainable under conditions of good system load factor. But it does not necessarily follow that the most profitable business for both utility and customer is always the business with the good load factor.

It may be in the end more expensive to force customers to provide smooth loads than to serve them with what they want or need. The instances where industrial customers can be encouraged to regulate their load factor are not as numerous as might be desired. The deterrent is that the total cost of the power is so small a part of the total production expense that it does not seem profitable to the proprietor to upset manufacturing processes to manipulate load factor, even if a credit is obtained for so doing. Such industries must expect to pay rates for poor load factor usage that will render the profitableness to the utility fully as great as good load factor usage.

Another slant on load factor arises in connection with purely hydro systems, especially where a large installation above minimum steam flow is required because of run-off fluctuations. Here a general increase in daily load factor is not particularly advantageous. One such company comments as follows: "The present system peak capacity with the largest generator out of service is 50 per cent greater than the annual average kilowatt primary energy capacity with our present daily and seasonal load variations. It is entirely probable that additional generating capacity will be required to carry our energy load before it is required to carry peak load. While aggressive and successful sales effort is being put forth, it is not being done for the specific purpose of increasing daily load factor. Our rates are such that we receive a return on investment in peak capacity just as well as on kilowatt-hours, so we feel that we should sell peak use if the customer's convenience requires it just as

Table II—Transmission Companies Show Both Gains and Losses in Load Factor

A wider range of gains and losses is found here than in the case of metropolitan companies. In general, they have less opportunity to profit by good industrial loads, more compulsion to add low-load factor rural loads and more incentive to build up residential and farm loads of sustained and off-peak characteristics.

Company	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	Ten-Year Change
1	51.6	58.7	58.2	55.4	57.0	57.4	59.6	61.6	60.9	63.2	+11.6
2	65.6	64.0	64.4	64.3	62.7	60.1	60.7	60.3	59.7	58.9	— 6.7
3	40.5	41.3	44.6	42.3	41.9	48.9	48.0	50.0	49.7	52.3	+11.8
4	57.5	55.7	52.7	59.6	60.0	59.5	55.2	59.4	63.0	61.0	+ 3.5
5	53.5	59.9	53.3	59.0	53.5	62.2	51.0	51.1	52.8	49.8	— 3.7
6	50.9	47.4	45.4	46.9	47.1	49.9	49.3	47.1	54.4	50.7	— 0.2
7	42.5	44.7	45.3	48.0	46.0	45.6	40.4	43.1	46.2	50.5	+ 8.0
8	56.3	48.0	46.8	53.0	55.5	55.0	59.8	58.2	59.2	55.5	— 0.8
9	69.4	54.6	56.1	70.9	81.0	75.7	76.2	75.8	71.7	70.5	+ 1.1
10	73.6	55.6	48.8	56.2	48.4	48.2	56.6	57.7	57.3	59.5	—14.1
11	66.3	57.6	51.4	56.4	56.6	51.0	60.0	57.0	60.2	54.0	—12.3
12	53.3	52.5	51.5	51.2	49.2	45.8	44.9	46.9	48.8	56.0	+ 2.7
13	61.5	60.9	63.1	63.5	51.9	58.4	62.8	57.3	80.0	75.7	+14.2
14	51.0	51.7	53.9	53.8	54.8	60.4	55.0	45.8	53.2	55.1	+ 4.1
15	64.7	58.1	58.2	60.7	59.5	55.7	54.0	54.9	54.4	54.2	—10.3
Unweighted average											—0.67

Daily Load Curves of Representative Utilities,

The shaded area is the growth in winter load. Further comparison with 1920 may be made by noting parenthetical key letters and referring to those load curves on pages 980-81 of ELECTRICAL WORLD, May 8, 1926
Character of loading is indicated by the data in Table III

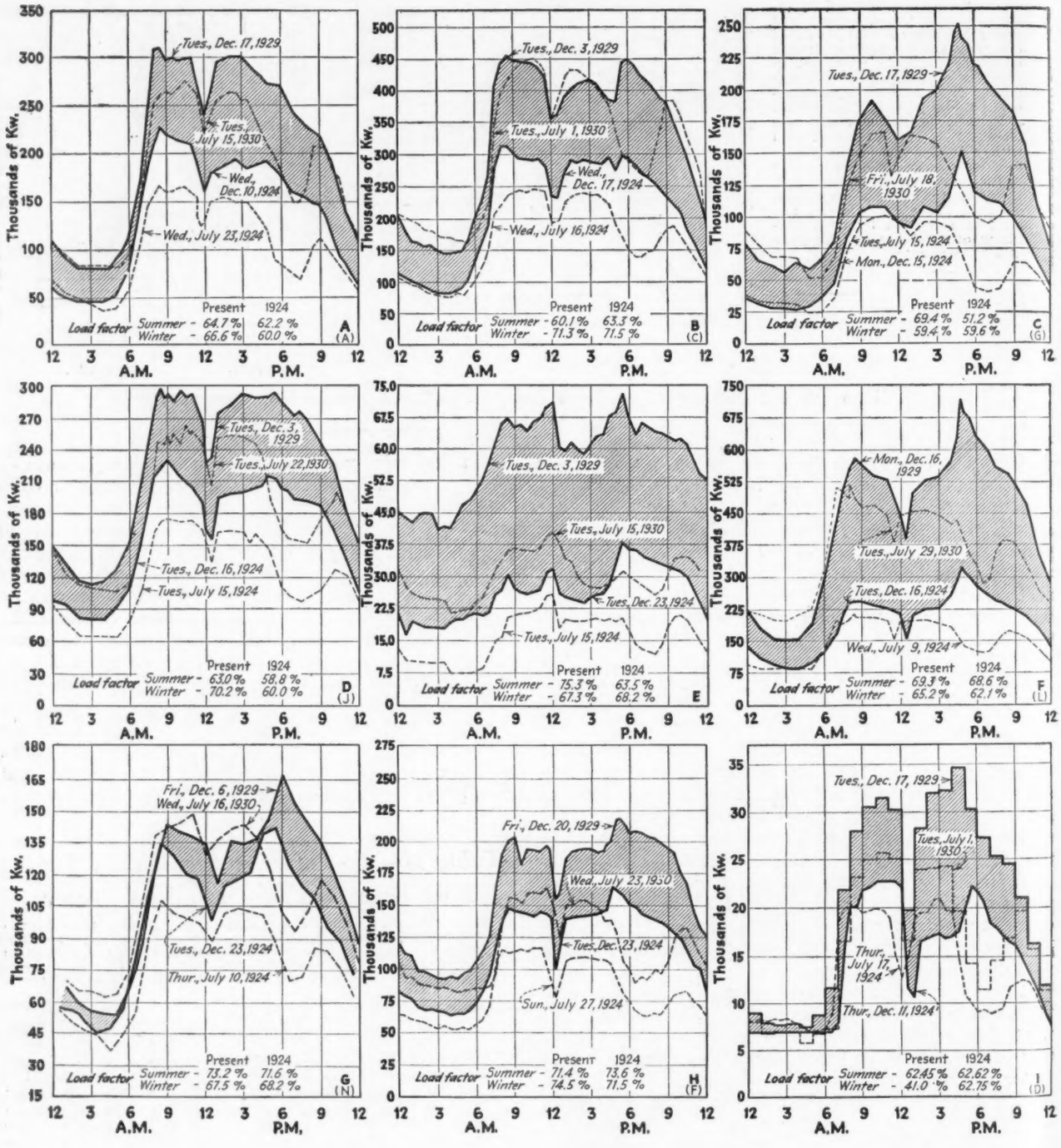
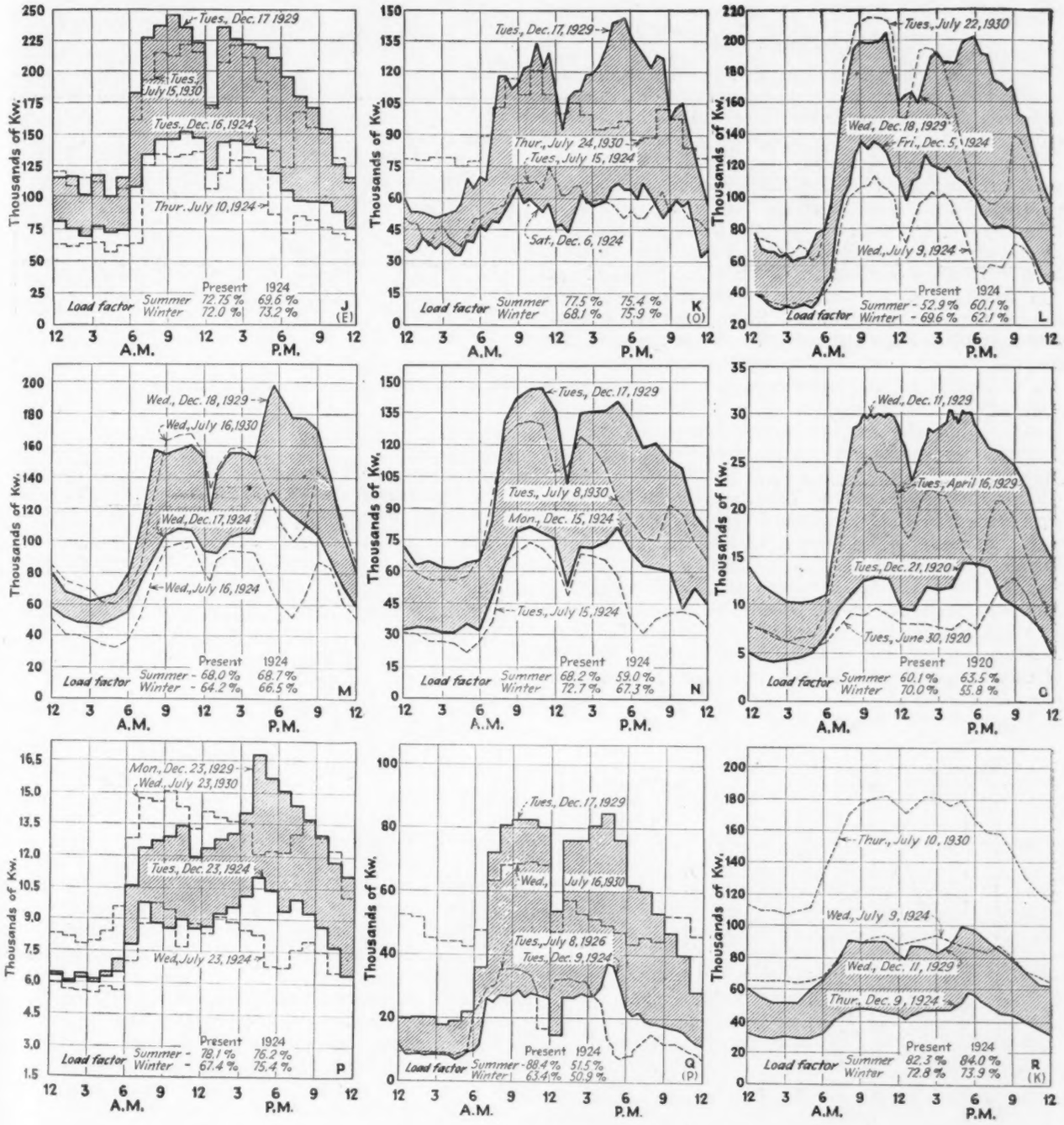


Table III—Per Cent Load Division (1929) of Utilities Shown Above

	Metropolitan								Transmission				
	A	B	C	D	E	F	G	Q	J	K	L	M	R
Residential consumption	11.6	11.5	12.6	11.5	32.8	7.9	11.8	8.0	2.3	9.1	10.5	13.5	9.0
Commercial light and small power	8.4	20.3	17.5	7.7	15.9	7.6	10.8	16.3	3.8	5.2	9.3	14.8	47.0
Wholesale power	50.8	42.5	29.3	52.3	10.5	37.5	50.8	17.6	38.4	42.3	52.2	38.8	25.9
Other companies, railways, municipal, etc.	29.2	25.7	30.6	28.5	40.8	47.0	26.6	58.1	55.5	43.4	28.0	32.9	18.1

Summer and Winter, 1924 and 1929-30


Thousands of Kw.
A.M.
P.M.
Tues., Dec. 17 1929
Tues., July 15, 1930
Tues., Dec. 16, 1924
Thur. July 10, 1924
Load factor Summer 72.75 % 69.6 %
Winter 72.0 % 73.2 %
J (E)
Tues., Dec. 17, 1929
Thur., July 24, 1930
Tues., July 15, 1924
Sat., Dec. 6, 1924
Load factor Summer 77.5 % 75.4 %
Winter 68.1 % 75.9 %
K (O)
Tues., July 22, 1930
Wed., Dec. 18, 1929
Fri., Dec. 5, 1924
Wed., July 9, 1924
Present 1924
Load factor Summer - 52.9 % 60.1 %
Winter - 69.6 % 62.1 %
L
Wed., Dec. 18, 1929
Wed., July 16, 1930
Wed., Dec. 17, 1924
Wed., July 16, 1924
Load factor Summer - 68.0 % 68.7 %
Winter - 64.2 % 66.5 %
M
Tues., Dec. 17, 1929
Tues., July 8, 1930
Mon., Dec. 15, 1924
Tues., July 15, 1924
Load factor Summer 68.2 % 59.0 %
Winter 72.7 % 67.3 %
N
Wed., Dec. 11, 1929
Tues., April 16, 1929
Tues., Dec. 21, 1920
Tues., June 30, 1920
Load factor Summer 60.1 % 63.5 %
Winter 70.0 % 55.8 %
O
Mon., Dec. 23, 1929
Wed., July 23, 1930
Tues., Dec. 23, 1924
Wed., July 23, 1924
Load factor Summer - 78.1 % 76.2 %
Winter - 67.4 % 75.4 %
P
Tues., Dec. 17, 1929
Wed., July 16, 1930
Tues., July 8, 1926
Tues., Dec. 9, 1924
Load factor Summer 88.4 % 51.5 %
Winter 63.4 % 50.9 %
Q (P)
Thur., July 10, 1930
Wed., July 9, 1924
Wed., Dec. 11, 1929
Thur., Dec. 9, 1924
Load factor Summer 82.3 % 84.0 %
Winter 72.8 % 73.9 %
R (K)

much as kilowatt-hours. Any effort on our part should be purely educational, to show the customer how he can best take advantage of our rates. The result might be to increase or decrease load factor."

In some instances the disparity between summer and winter loads makes the annual load factor of considerably greater significance than the daily load factor. This is exemplified by chart R, in which the summer day output and peak are both double the winter values. In both seasons the daily load factor is unusually good, and it is therefore evident that the circumstances call for seasonal business which will improve the annual load and use factors.

In some quarters the slow progress of load-factor improvement is attributed to a dilution effect. Many of the more desirable loads were acquired several years ago and the later additions have resulted in their poorer load factor offsetting the improved diversity. Until the accelerated sale of refrigerators and off-peak water heaters changed the picture the appliance sales were largely those which contributed to the day load level established by industrial consumption. The drive on refrigerator, water

heater and, here and there, on space heater will have to be relied upon to shift the residential load block to the off-peak hours and thus make a better load factor showing for the residential business.

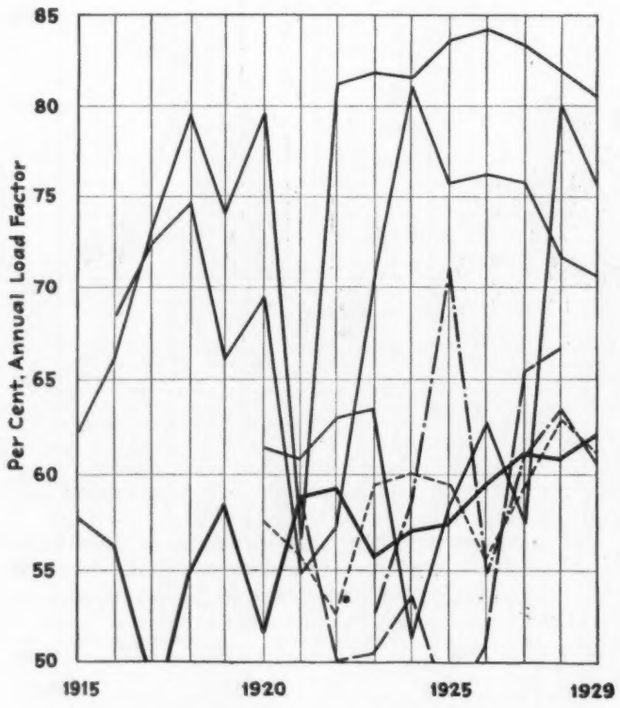
Effect of large loads

There is considerable risk incurred in high load factor where it is attained by dependence on one or at most a few large industrial loads that comprise the bulk of the output.

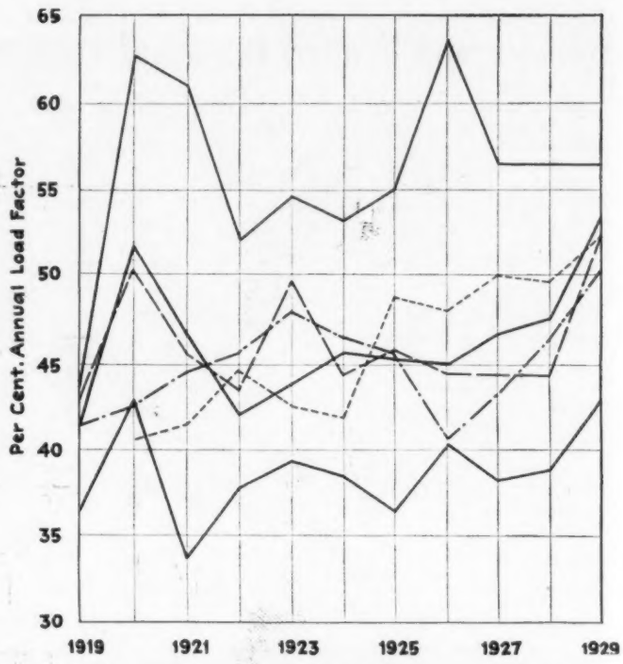
The rather violent fluctuations of annual load factor for those companies which stand highest in such a scale of rating show that beneficial results are not to be expected when depression hits one of these industries. On the other hand, general industrial depression seems to have little effect on the load factor of a diversified system because the peaks are lost without corresponding loss at the non-peak periods. Such diversity is characteristic of the companies which, while having a less striking value of load factor, have nevertheless shown the greatest degree of improvement; the improvement is moderate but consistent.

Use factor improvement has been hampered by both the industrial depression and the enlarged co-ordination of hydro and steam.

On a national basis the 4,320,000 kw. of hydro capacity reported in 1922 turned out 17,000,000,000 kw.-hr. with a use factor of 44.7 per cent. The steam use factor for the 10,500,000 of capacity and 26,500,000,000 kw.-hr. was 28.7 per cent. The combined use factor in 1922 was 34.7 per cent. In 1929 the hydro value was 45 per cent (8,500,000 kw. and an output of 33,500,000,000 kw.-hr.); the steam figure was 30.6 per cent for the 22,000,000 of capacity and 59,000,000,000 of output; the combined use factor for 1929 was 35.7 per cent. All three bases of use factor have improved; very slightly, it is true. Evidently interconnection, drought and business depression jointly have no resultant effect on the utilization of generating capacities, relatively or absolutely, if the national picture is viewed.



The best annual load factors show wide swings



The moderate annual load factors show a more uniform drift

Locally, both steam and hydro are reported to suffer in use factor as much as they gain by their co-ordination. The more complete the interconnection the less the reserves required, and this tends to improve the use factor by keeping down the installed capacity. On the other hand, the vagaries of hydro run-off necessitate co-ordinated operation of steam generation in a way that curtails use factor opportunities. Most of the economic gains from interconnection can apparently be credited to operating benefits rather than to capital conservation in so far as use factor serves as an index.

Use of installed capacity is of course better indicated by use factor than by load factor. Under present conditions of interconnection operation the use factor is determined to a large extent by available water and base load steam capacity and not as much as formerly by the local load characteristics. This implies that more attention should be given in the future to use factor data in economic analyses of system performance. Drawing inferences about use factor from load factor data is also hazardous, because interconnection diversity and available hydro supply are regularly drawn upon for system peaks. The local station daily load factor may then be much better than that of the over-all system load, but its annual use factor may be adversely affected by the seasonal adjustments.

Thus of the eighteen systems' typical daily load curves presented herewith, eleven companies improved their 1930 summer load factor and seven lost ground. Eight have done better in the winter and ten worse. There are five which made gains both summer and winter and

Table IV—Five Outstanding Winter and Summer Day Load Factors and Corresponding Improvements Over 1924

Summer			Winter		
Company	Load Factor	Per Cent Increase	Company	Load Factor	Per Cent Increase
Q	88.4*	36.9*	H	74.5	3.0
R	82.3	—1.7	R	72.8	—1.1
P	78.1	1.9	N	72.7	5.4
K	77.5	2.1	J	72.0	—1.2
E	75.3	11.8	B	71.3	—0.2

Table V—Five Largest Increases in Winter and Summer Day Load Factors Since 1924 and Present Load Factors

Summer			Winter		
Company	Per Cent Increase	Load Factor	Company	Per Cent Increase	Load Factor
Q	36.9*	88.4	O	14.3	70.1
C	18.2	69.4	Q	12.5	63.4
E	11.8	75.3	D	10.2	70.2
N	9.2	68.2	L	7.5	69.6
D	4.2	63.0	A	6.6	66.6

*Gain principally due to large night load supplied to interconnected hydro system.

four which lost in both seasons. Six bettered their summer status and fell back in the winter, while three companies experienced the inverse change. Some of the most striking gains in over-all system load factor are manifestly due to metropolitan systems supplying night load to interconnected hydro systems both summer and winter. In such cases load factor is a distinctly misleading index of local load leveling.

Load factor and use factor still retain much of their indicative value as to advantageous development of loads and efficacious utilization of generation facilities. Some diminution of their significance has occurred because of the extensive interchange of energy between systems. There is also a growing degree of difficulty in segregating that energy in arriving at the ratios. New types of usage have enhanced the diversity factor and this has had its effect on load factor independently of specific drives for loads of individually good load factor. In fact, some of the better system load factors exist without dependence on bulk loads of sustained usage. One company has established better system load factor by inducing large industrial users with good load factor to shift day to night use, thereby purposely presenting a lowered individual load factor.

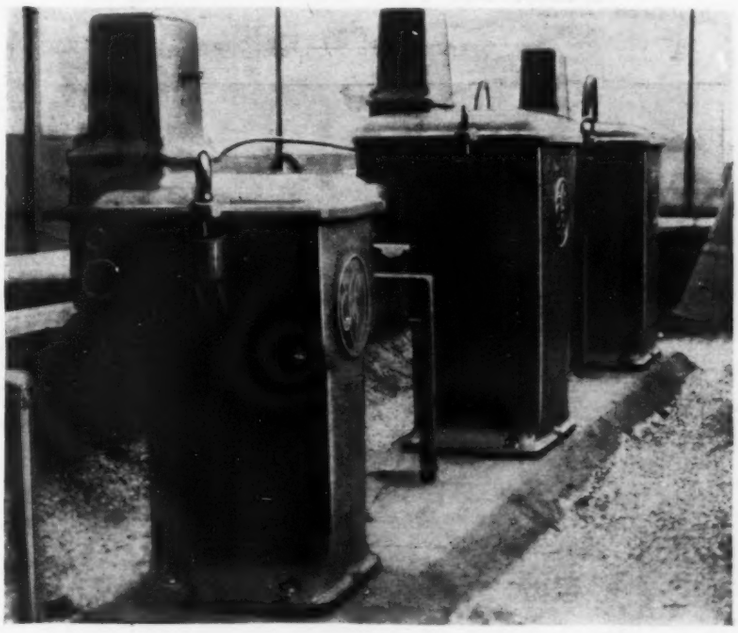
Actually, however, there is a noticeable tendency to temper the economic urge toward an ideal load factor with a recognition of factors in other directions. It is not to be felt that there should be a slackening of effort to fill the valleys and check the peaks. Every reasonable effort toward this end is as justifiable as ever. But the German adage that "man proposes but God disposes" is not wholly inapplicable to the circumstances that determine system load factors. Customers of all sorts are prone to feel that to a considerable extent they know what is best for them. Undue pressure based on blind adherence to economic formulas may well lead to loss of intangible psychological benefits that in the end will vitiate the pecuniary gains from molded load characteristics. Any disposition to be content with modest progress in load leveling is traceable to a growing observance of this public temper.

Water heaters, night and week-end industrial loads, more highway and sign lighting, pumping and compressing, space heating are off-peak loads that can be added with profit to both utility and consumer. They fit periods when the charge can justifiably be low enough to attract the business and still make a profit. From the users' standpoint any time of day or night is as acceptable as another for such consumption. Minimum necessity for attendance and night labor, ability to store the heat or store the accumulated product, minimum interference with the flow system of production are the attributes of the loads that will build load factor unobtrusively, steadily and profitably. The moral is to get the loads that work while man sleeps or recreates his body and soul.

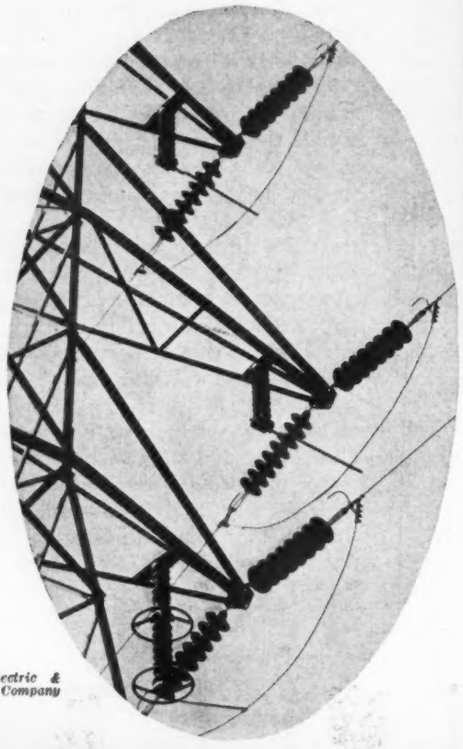
▼ ▼ ▼

Weatherproof Control Equipment

The possibility of saving space in the installation of motor-control equipment by putting it out of doors is here illustrated. These are three Electric Controller & Manufacturing Company low-voltage automatic compensators mounted on the roof of an oil refinery building. The motors drive crude-oil booster pumps. The compensators are oil-immersed and weatherproof.

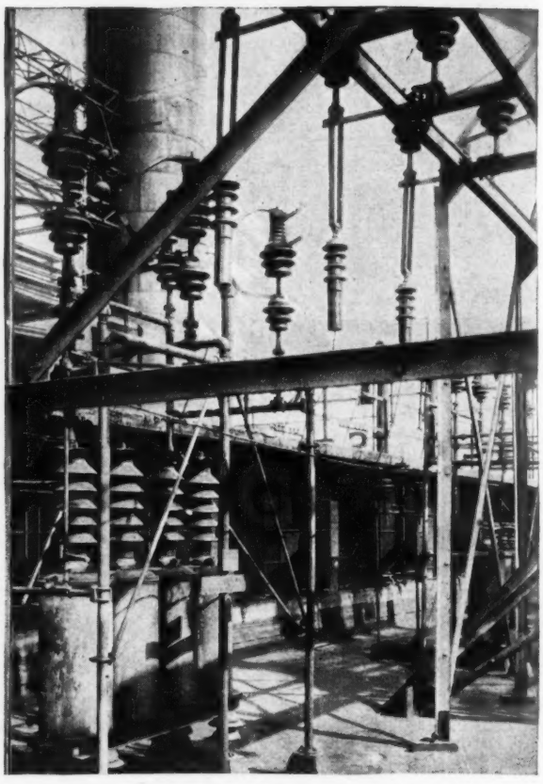


Arrester Developments Alter Installation Practices

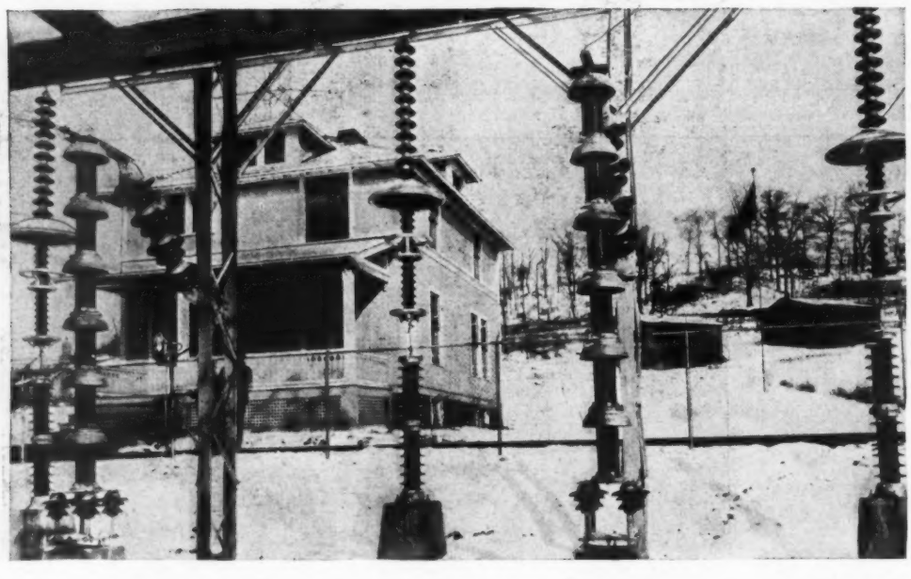


Autovalve arrester installations compared on 66 kv. line. An integral series gap is housed in the casting of the arrester mounted on the lowest crossarm. The series gap of those mounted on the two other crossarms consists of the space between the line conductor and an electrode bolted to the arrester element.

Westinghouse Electric & Manufacturing Company



Line type arresters supplant electrolytic equipment at 22-kv. station. Because of the large number of lines that enter the 22-kv. bus and the relatively short circuit distances involved between the sets of arresters and the lines at the Springdale station of the West Penn Power Company line type arresters were installed. It was decided that these arresters would give adequate protection, since parallel operation of line arresters furnishes considerable discharge capacity. Supplanted equipment in the background.



Autovalve arresters conserve space in 132-kv. service. These arresters at the Lake Lynn station of the West Penn Power Company are partly suspended from a station structure which also supports the coupling capacitors for carrier current.

1931 Looks Like a Good Year

By JOHN E. ZIMMERMANN

President United Gas Improvement Company

THE year 1930 was a very severe test for American business. The public utilities stood this test better than any other industry that I know of. Sales of gas and electricity for domestic, commercial and industrial purposes were practically the same as for 1929.

Owing to the great diversity of industries in the territory served by the United Gas Improvement Company and the more stable social and economic conditions there, the gas and electric sales of the properties in the U.G.I. System were actually ahead of 1929.

I am so encouraged by the way in which our U.G.I. properties have stood the test of the greatest depression in many years that we have arranged our construction budgets for 1931 without any reference to existing business conditions. We are planning to spend in the way of betterments, extensions and improvements in 1931 something over $31,000,000.

So satisfied am I that prices have about reached the bottom that we have carefully gone over our budgets for 1931 with the object of advancing such projects as might be undertaken at once and so take advantage of the low price of materials.

From the standpoint of the industry as a whole, I am convinced that the interests of the public and the utilities are always best served by effective state regulation, and any well-considered measures calculated to strengthen the confidence of the public in the regulation of public utilities should receive the co-operation and support of the entire industry.

Rates should be constantly adjusted so as to yield only a fair and reasonable return on the value of the property devoted to the public use. This return should be sufficient at all times to attract new capital and to include a reward for efficient, enlightened and honest management. Economies resulting from efficient management and from mergers, consolidations and interconnections should be shared with the consumer in reduction of rates.

Publicity in the financial affairs of a public utility inspires confidence on the part of the stockholder and the public. Public utilities, therefore, should issue at frequent intervals full statements of their earnings in sufficient detail to give their stockholders a thorough understanding of the affairs of their companies.

Holding companies are essential to the expansion and development of public utilities and must not be used to exploit either the consumers or the operating company. Full and complete disclosure should be made of all agreements between the holding company and its subsidiaries covering services rendered by the holding company for financing, managing, purchasing and construction, to insure that they are fair to the consumer, the operating company and the holding company.

Government should confine itself to regulation of public utilities and not go into the public utility business. Government should not compete with any of its citizens in any field of business.

I look for a gradual and steady improvement in business in 1931 and am confident that the public utilities, having given such a good account of themselves in 1930, will be among the first to feel the effect of such improvement in general conditions through increased sales of gas and electricity for industrial purposes.

A time to

——avoid exploitation by the holding company

——disclose agreements for holding company services to subsidiaries

——undertake construction, taking advantage of low prices for materials

——publish the facts on financial matters, issuing more informative statements

Latest Data on 1,250-Lb. Gilbert Station*

By E. M. GILBERT

President and Chief Engineer W. S. Barstow & Company

Some greatly needed information on the performance of high-pressure steam plants has been released† in the last few months, at least for two stations—Deepwater and Gilbert. In this discussion Mr. Gilbert supplements his A.S.M.E. paper, which gave experience during the first few months of operation.

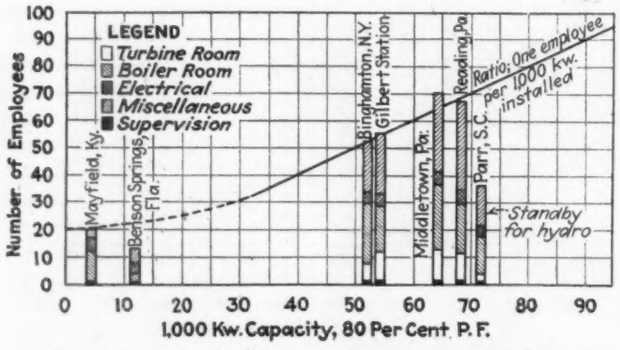
Aside from discussing the solution of troubles which have been encountered, he presents recent unit economy figures, relative costs compared with lower pressure plants and graphs showing that the quantity of labor has not been increased due to high pressure.

It is interesting to note that the Gilbert plant was built within the estimate and for only 7 per cent more than the 350-lb. Middletown plant.

SOME months of continuous operation have passed since the data originally submitted on Gilbert station of the New Jersey Power & Light Company was printed† and some changes have taken place and some additional experience has been gained. Very little trouble can be ascribed to the pressures and temperature used. Most of the troubles are similar to those occurring in any new plant, especially where newly developed machines or apparatus arrangements are being tried out, and a cure is apparent in each case.

Piping—All piping joints are of the gasket type, special metal gaskets being used on the high-pressure and composition on the low-pressure joints. All flanges for the high-pressure joints are made with 35 to 50 per cent greater thickness than the 1,350 lb. standard, this being done to prevent distortion of the flanges. Threads on the studs are considerably finer than those used under the standard. The high-pressure joints have all been satisfactory with the exception of two, which have given trouble several times. It was decided that these two leaks were due to lack of flexibility in the piping and added flexibility is being provided at these points.

On high-pressure piping less than 2 in. in diameter, where the joints are subjected alternately to high and low temperatures, leakage has been encountered even with the metal gaskets. Experience with small forged fittings, which are screwed onto the pipe and then welded, has been highly satisfactory, and where necessary on this smaller piping this method will be used.



Relative number of employees required in seven steam stations

On low-pressure joints composition gaskets and standard flanges and bolting are being used.

Turbine—Sticking of the valve stems in their cast-iron bushings occurred frequently at first on the high-pressure turbine. These bushings were replaced with nitralloy, and present operation shows this to be a decided improvement, but it is too early to state whether this is a complete cure or not. Very poor regulation was obtained at first with loads from 28,000 to 34,000 kw. This trouble was thought to be due to the springing of the camshaft under load, all operating arms being keyed to a steel shaft. This arrangement was changed so as to apply the load directly to new steel cam arms, merely using the shaft as a bearing and thus eliminating any strain on it. This appears to be satisfactory to date.

Considerable trouble has been experienced with oil leakage from No. 1 bearing of the high-pressure turbine. The loss from this bearing has been as much as 100

*Based on discussion before A.S.M.E. convention.

†See ELECTRICAL WORLD, *page 1044, December 6, 1930.*

gal. per day in its worst condition. A new bearing has just been installed, but results are not yet known.

Great care must be exercised in starting the turbine. If too much non-condensable gas or air remains in the shell at the time of opening of the throttle the pressure in the turbine may increase enough to burst the lead diaphragm used in connection with the vacuum tripper. Removal of this air before starting is difficult to accomplish as the turbine gland seals are practically inoperative until the turbine is moving.

Trouble was experienced during the lightning season by the low-pressure turbine tripping off with a sudden large change of load. This was caused by the governor controlling the intercepting valve not acting quickly enough to prevent the steam contained in the piping, reheaters, etc., from entering the low-pressure turbine and causing overspeeding. This governor was set to act more quickly.

When the turbine operated under full steam flow the capacity gradually dropped from 56,000 kw., which had been the high point of operation, to 46,000 kw. Investigation, by the comparison of pressures under the turbine shell, etc., led to the belief that the turbine blading was choked with foreign material. The turbine was not opened, so that the exact point of clogging was not determined. Washing of the turbine with saturated steam was resorted to in an endeavor to see whether this scale formation could not be dissolved and removed this way. The result was satisfactory, and the capacity of the machine was gradually brought back. This scaling of the turbine has been traced to the evaporator, changes in which are being made.

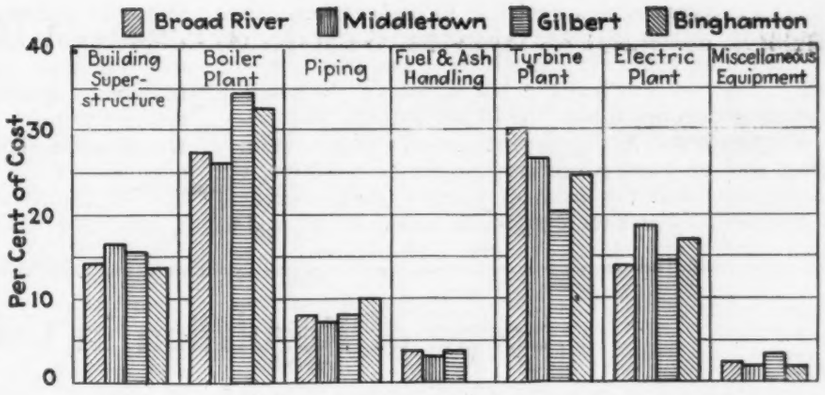
Boiler Feed—Some time after starting, leakage in the boiler feed pump casings developed, requiring that they be welded. After the welding, leaking occurred between diaphragms, this apparently being caused by a warped casing. These have since been rebored and it is hoped that this condition has been corrected, as no similar trouble was experienced in the pumps, where no distortion has taken place, nor in these pumps before welding.

It was mentioned in the previous report that a Mercon regulator was being installed between primary and secondary pumps. However, due to failure of the manufacturer to supply a satisfactory piece of equipment, no data on its operation can be given. It has been determined by hand operation of a valve between the two pumps that maintenance of a constant differential will accomplish the desired results.

Induced Draft Fans—Stellite is being used in repairing the inlet vanes of the induced draft fans and it seems to increase their life materially. Casings have been lined with removable steel plates, which can be easily taken out and replaced as they wear through.

The floats on the fans, which wear at the outer tips, are having new metal welded into place as wear occurs. Operators have been cautioned that the present floats, which are made of heat-treated steel, can only be welded to a very limited extent on the outer tips. It seems that a fan built from materials which prevent rapid and simple repairs is not what is desired in the average power plant, and we are asking the manufacturer to look into the possibility of building these wheels so that the floats may be repaired by adding metal to replace wear or by the welding of wearing strips in place on the floats.

Burners—All experiments to reduce secondary air pressure to allow use of present vent fans have been



Comparative cost of 300-, 400- and 1,200-lb. steam stations

	Broad River	Middletown	Gilbert	Binghamton
No. of turbo-generators	3	2	1	1
Total kw. capacity	72,500	65,000	55,000	30,000
Turbine operating pressure (lb. per sq. in.)	300-400	325	1,200	385
Fuel fired	Pulv. coal	Pulv. coal	Pulv. coal	Pulv. coal
No. of boilers	6	6	2	3

B.t.u.'s per Kilowatt-Hour and Load Factor at Gilbert Station

Data for March to September period were presented on page 1,046 of the December 6, 1930, issue of ELECTRICAL WORLD. The B.t.u.'s per kilowatt-hour will be reduced when all unusual troubles are removed and steady operation is possible.

Week Ending	Gross Generation (1,000 Kw.-Hr.)	Ratio of Station Use to Net Output, per Cent	Maximum Hours Output (1,000 Kw.-Hr.)	Plant Service Hours	Station Load Factor, Per Cent	B.t.u. per Net Kw.-Hr.*	B.t.u. per Lb. of Coal
Sept. 6	6,214	8.53	54	168	67.25	13,421	14,139
Sept. 13	5,359	8.42	52	168	57.80	12,624	14,139
Sept. 20	6,017	8.28	52	138	65.10	13,633	14,139
Sept. 27	5,791	8.79	54	144	62.67	12,572	14,139
Oct. 4	7,072	6.97	55	135½	76.54	12,610	14,139
Oct. 11	6,912	7.46	54	140	74.81	12,731	14,139
Oct. 18	7,140	7.49	54	139½	77.27	12,825	13,883
Oct. 25	7,690	7.37	56	144½	83.23	12,343	13,883
Nov. 1	7,723	7.27	56	156	83.58	12,071	13,879
Nov. 8	7,093	7.20	55	146½	76.76	12,708	13,879
Nov. 15	5,596	8.55	54	156	60.56	12,381	13,879

*Based on mine weights; includes all coal used for heating, testing, shutdowns and restarting, without any benefit from No. 4 feedwater heater.

without success and new vent fans of higher pressure are now being installed. Some maintenance is still required on the burner cones and there is some slag trouble in the ashpit and on the boiler tubes when the boilers are operating continuously at the higher ratings.

Evaporators—During the first months of operation a great deal of leakage occurred in the economizers, the result being that the make-up for the system increased very materially and the evaporator had to be worked at unusual capacities. Irregular operation of the evaporator still further increased its overload at times. Under normal conditions the evaporator did not meet guarantees, too great a quantity of solids being carried over into the distilled water. Various changes, such as alterations of steam baffle, limit to steam supply lines, etc., were adopted and will be explained later. But all the changes are not completed as it is too early to state definitely whether the solids carried over will be reduced to the

Scope of Regulation in Different States of Electric

The data in the table have been condensed from "Bonbright Utility Regulation Chart," just published by Bonbright & Company, Inc., New York City, in "A Survey of State Laws on Public Utility Commission Regulation in the United States." The adaptation here departs from the original only to the extent of omitting specific data

STATE	Electric Power and Light Utilities in General	Accident Reports	Accounting	Capitalization and Issue of Securities	Certificates of Convenience and Necessity	Consolidations and Mergers	Right to Change Contract Rates	Depreciation	Discrimination	Construction of Electric Transmission Lines	Joint Use of Facilities	Leases	Rates and/or Rate Schedules	Service	Terminable or Indeterminate Permit	Specific Authorization to Make Valuation
Alabama	Yes	No	Yes	Yes	Yes	No	Yes	Ltd.	Yes	No	Ltd.	Yes	Yes	Yes	No	Yes
Arizona	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Arkansas[1]	Yes	No	No	Yes	Yes[2]	No	No provisions	No	Yes	No	No	No	Yes	Yes	No	Yes
California	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Colorado[3]	Yes	No	Yes	No	Yes	No	No provisions	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
Connecticut	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Elec. only	Yes	Yes	Yes	No	No[6]
Delaware[7]																
Dist. of Columbia	Yes	Yes	Yes	Yes	Yes	Yes	No provisions	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Florida[7]	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Georgia	Yes	No	Yes	Yes	No	No	No provisions	No	Yes	Ltd.	No	No	Yes	Yes	No	Yes
Idaho	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
Illinois	Yes	Yes	Yes	Yes	Yes	Yes	No provisions	Yes	Yes	Yes	Yes	Yes	Yes	Yes[8]	Yes	Yes
Indiana	Yes	Yes	Yes	Yes	Yes	Yes	No provisions	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Iowa[9]	No	No	No	No	No	No	No provisions	No	No	Yes[14]	No	No	No	No	No	Yes
Kansas[1]	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Limited	Yes	Yes	No	Yes
Kentucky[11]	No	No	No	No	No	No	No provisions	No	No[11]	No	No	No	No[11]	No[11]	No	No[5]
Louisiana[12]	Yes	No	No	No	No	No	No provisions	No	Yes	No	No	No	Yes	Yes	Yes[12]	No[5]
Maine	Yes	Yes	Yes	Yes	No	Yes	Limited	No	Yes	Ltd.	Yes	Yes	Yes	Yes	No	Yes
Maryland	Yes	Power and heat only	Yes	Yes	Yes	Yes	No provisions	No	Yes	No	No	Yes	Yes	Yes	No	Yes
Massachusetts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes
Michigan	Ltd.	No	Yes	Yes	Yes	No	No	No	Electric only	Yes	No	No	Yes	Yes[14]	No	Yes
Minnesota[7]	No	No	No	No	No	No	No provisions	No	No	Yes	No	No	No	No	No	No
Mississippi[7]	No	No	No	No	No	No	No provisions	No	No	No	No	No	No	No	No	No
Missouri	Yes	No	Yes	Yes	Yes	Yes	No provisions	Yes	Yes	No	No	Yes	Yes	Yes	No	Limited
Montana	Yes	Yes	Yes	No	No	No	Yes	No	Yes	No	No	No	Yes	Yes	No	No
Nebraska[13]	Yes[16]	No	No	Yes	No[17]	Yes	No provisions	No	Yes	Yes	No	No	Yes[16]	Yes[16]	No	No[5]
Nevada	Yes	Yes	Yes	No	Yes	No	No provisions	No	Yes	Yes	No	No	Yes	Yes	No	Yes
New Hampshire	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No[5]
New Jersey	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes
New Mexico	Yes[18]	No	No	No	No	No	No provisions	No	Yes	No	No	No	Yes	Yes	No	No[5]
New York	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	No	Yes
North Carolina	Yes	No	No	No	No	No	Yes	No	Yes	No	No	No	Yes	Yes	No	No[5]
North Dakota	Yes	No	Yes	Yes	Yes	Yes	Limited	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Ohio	Yes	No	Yes	Yes	No	Yes	No provisions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Oklahoma	Yes	No	Ltd.	No	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes[19]	Yes	Yes
Oregon	Yes	Yes	Yes	No	Yes	No	No provisions	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Pennsylvania	Yes	Yes	Yes	Ltd.	Yes	Yes	No provisions	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes
Rhode Island	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Ltd.	No	No	Yes	Yes	No	No[5]
South Carolina	Yes	No	Yes	No	No	No	Limited	No	No	No	No	No	Yes	Yes	No	Yes
South Dakota[7]	No	No	No	No	No	No	No provisions	No	No	No	No	No	No	No	No	No
Tennessee	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Texas[11]	No	No	No	No	No	No	No provisions	No	Natural gas only	No	No	No	Natural gas only	Natural gas only	No	No[5]
Utah	Yes	Yes	Yes	No	Yes	No	Limited	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes
Vermont	Yes	Yes	Yes	Yes	No	Yes	No provisions	No	Yes	No	No	Yes	Yes	Yes	No	No[5]
Virginia	Yes	No	No	Ltd.	No	No	Yes	No	Yes	No	No	No	Yes	Yes	No	Yes
Washington	Yes	Yes	Yes	No	No	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes
West Virginia	Yes	No	Yes	No	Water power company only	No	Yes	No	Yes	No	Yes	Water power company only	Yes	Yes	No	No[5]
Wisconsin	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Limited	Yes	Yes	Yes	Yes
Wyoming	Yes	Yes	Yes	No	Yes	No	No provisions	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes

1. Limited jurisdiction in municipalities.
2. No jurisdiction within certan counties.
3. No jurisdiction within home rule cities by decisions of Supreme Court.
4. Jurisdiction over rates for service furnished outside municipal boundaries by decision of Supreme Court.
5. The right to determine valuation is a necessary incident of rate-making power.
6. This state has no commission regulatory of public utilities.
7. The commission has no general regullatory jurisdiction over electric or gas companies. Exceptions to this statement are indicated in the Bonbright chart.
8. Cities are authorized to grant terminable permit to street railroads and/or public utility motor vehicles.
9. The commission has no general jurisdiction over electric or gas companies, but has jurisdiction over electric transmission lines.
10. No jurisdiction of public utilities and common carriers situated and operated wholly or principally within a city, or operated for its benefit.
11. The commission has no general jurisdiction over electric or artificial gas companies, but has jurisdiction over natural gas companies.
12. Subject to certain optional powers of municipalities to regulate local utilities.

required point, although operation has already been materially improved.

Miscellaneous—Such troubles as occurred with heaters, reheaters, economizers, etc., have been overcome except for leaking in the rolled joint of the economizer, and that is in the hands of the manufacturers.

No trouble with the water walls or brickwork has been encountered. Not a brick has been replaced in the furnaces and no water wall leaks have occurred.

Light and Power Utilities

pertaining to other than electric utilities; facts about the composition, appointment, salaries and tenure of commissions and certain other items are also omitted.

Published by courtesy of Bonbright & Company, Inc.

Wire Crossings	Complaints and Petitions Made by		Regulation of Municipal Electric Plants				Accounting Classification Adopted for Gas and Electric Companies
	Consumer	Commission	Accounting	Rates and / or Rate Schedules	Reports	Service	
No	Yes	Yes	No	No	No	No	Yes*
No	Yes	Yes	No	No	No	No	Electric only*
No	Yes	Yes	No	No	No	No	Electric only*
Yes	Yes	Yes	No	No	No	No	Electric only
Yes	Yes	Yes	No	(See Note 4)	No	No	Yes*
Yes	Yes [1]	Yes	No	No	Yes	No	Yes*
No	Yes	Yes	No	No	No	No	Yes
No	No	No	No	No	No	No	No
No	Yes	Yes	No	No	No	No	Yes*
No	Yes	Yes	No	No	No	No	Yes*
Yes	Yes	Yes	No	No	No	No	Yes*
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes*
Yes	No	No	No	No	No	No	No
Yes	Yes	Yes	No	No	No	No	Electric only*
No	No[11]	No[11]	No	No	No	No	No
No	Yes	No provisions	No	No	No	No	Yes*
No	Yes	Yes	Yes	Yes	Yes	Yes	Electric only*
No	Yes	Yes	Yes	Yes	Yes	Yes	Yes*
Yes	Yes	Yes	Yes	Limited	Yes	Limited	Yes*
Yes	Electric only	Electric only	Yes	No	Yes	No	Yes*
Yes	No	No provisions	No	No	No	No	No
No	No	No provisions	No	No	No	No	No
Limited	Yes	Yes	Yes	Yes	Yes	Yes	Electric only
No	Yes	Yes	Yes	Yes	Yes	Yes	Electric only
Yes	Yes	No provisions	No	Limited	No	No	No
Yes	Yes	Yes	No	Limited	Limited	No	Yes*
No	Yes	Yes	No	No	No	No	Yes
Yes	Yes	Yes	Yes	Limited	Yes	Yes	Yes*
No	Yes	No provisions	No	No	No	No	No
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes*
Yes	Yes	No provisions	No	No	No	No	No
Yes	Yes	Yes	Yes	No	Yes	No	Yes*
Yes	Yes	Yes	Yes	No	No	No	Electric only
Yes	No provisions	No provisions	No	No	No	No	Electric only*
No	Yes	Yes	No	No	No	No	Yes*
Yes	Yes	Yes	Yes	No	Yes	No	Yes
No	Yes	Yes	Yes	Yes	No	Yes	Electric only
No	Yes	Yes	No	No	No	No	No
Limited	No provisions	No provisions	No	No	No	No	No
Yes	Yes	Yes	No	No	No	No	Yes*
No	Natural gas only	Natural gas only	No	No	No	No	No
No	Yes	Yes	Yes	Yes[20]	Yes	Yes	Yes*
No	Yes	No provisions	No	Yes	Yes	Yes	Yes*
Yes	Yes	Yes	No	No	No	No	Yes*
No	Yes	Yes	No	No	No	No	Electric only*
Yes	Yes	No provisions	Yes	Yes	Yes	Yes	Electric only*
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes*
Limited	Yes	Yes	Yes	Yes	Yes	Yes	Electric only*

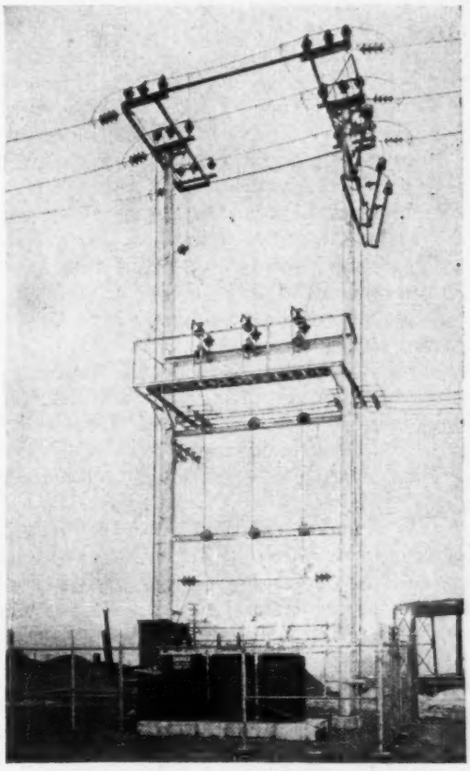
13. Limited to cities having populations of 100,000 or more.
14. No authority over rates fixed by franchise.
15. The commission has only limited jurisdiction over gas and electric companies.
16. Jurisdiction applies only outside of incorporated cities or villages.
17. Jurisdiction over construction of electric transmission lines.
18. No jurisdiction in cities of 10,000 or more inhabitants.
19. Act held unconstitutional by State Supreme Court.
20. No jurisdiction by decision of State Supreme Court.

*The classification of accounts prescribed is the Uniform Classification of Accounts adopted by the National Association of Railroad and Utilities Commissioners.

Substation Standardized for Small Industrials

Typical of the equipment and arrangement adopted by one utility company for loop tie-in substations for relatively small industrial customers is this 22-kv. Steubenville coal and mining station of the Ohio Power Company.

Air-break switches are installed on the line sides of the tap connections leading to transformers and protective equipment, and switches of this type also are interposed in advance of the delta-connected transformers. This type of station, surrounded by a protective industrial wire fence, is used for capacities up to 1,000 kva. Small installations have the transformers platform-mounted. Wooden poles in concrete settings raised above



Loop circuit tie-in substation for small industrials

ground level are standard. Transformers with ground mounting are placed on a concrete platform as shown.

Meters and test blocks are box-mounted at the foot of one pole. Low-tension conductors leave the station at about mid-pole height.

According to Philip Sporn, electrical engineer American Gas & Electric Company, this offers a thoroughly satisfactory arrangement, reliable, inexpensive, of attractive appearance and long life. Arrester protection is provided on both the high- and the low-tension side of the transformers.

Give Dealers Profit, to Build Central-Station Load

By J. C. PLANKINTON

Sales Manager Northwestern Electric Company, Portland, Ore.

In order to place electrical appliances of all sorts, including small appliances, electric ranges, electric refrigerators, electric water heaters, washers, ironers, etc., among those items to receive preferred attention by these dealers, there must be a widening of the margin between their cost to the dealer and his selling price. If this can be accomplished through greater discounts, this, of course, would be preferred over raising the list or retail price.

I OFTEN feel that we talk and write of our difficulties too much. However, I am tempted to offer a suggested change in national pricing policy on the full line of electrical appliances as an aid to alleviating present much-discussed grievances of dealers against central-station merchandising practices. We have long since learned that our best advertisers are our satisfied customers, therefore it should be our sincere aim to satisfy as nearly as possible our dealers in their insistence upon a place in the picture of retail distribution of electrical appliances. We all know that the most satisfying result to a retainer of any line is volume, with a margin sufficient to leave a reasonable net after deducting all expenses. Whoever heard of a merchant showing any displeasure at handling any item that was giving satisfactory volume and putting net profit into his operation? On the other hand, what dealer or class of dealers are going to push actively, or be happy in selling, an item that is a drain on net after taxes?

There is no doubt that the central stations, due to their greater interest in putting on their lines current-consuming devices, were the logical agencies for the manufacturers to look to in carrying on the very necessary early pioneering effort in selling and popularizing these devices. But if we are ever to have these electric home servants actually placed in our consumers' homes in numbers commensurate with their usefulness, we must have the full co-operation, active participation and vigorous effort of all dealers in the selling of electrical appliances. To put this into effect we must begin to shape our policies to this end. I am sure that if we honestly and faithfully do this we will have solved our dealer-central station merchandising problem.

Utility merchandising must continue

The bringing about of this condition will not, in my judgment, require that the central stations lessen their own merchandise sales activity at all. I am sure that the thoughtful dealer would agree that for the central station to discontinue its sales effort would be a step in the wrong direction, if we expect to secure greater electrical appliance volume for the dealer, central station and manufacturer.

We all know that the furniture dealer, department store, hardware dealer, contractor-dealer, etc., are in the business of buying and selling for the sole purpose of making money and they are going to devote the greatest amount of space, effort and push in selling those items that produce for them the greatest amount of profit.

When we consider that today electric service plays a most important part in the very life and comfort of every home to which it is available, is there any conceivable reason why those devices, whose use in the home is so necessary to the complete utilization of this service, should not be a major part of the dealers' sales volume, instead of a mere side line, as is the case in most stores today?

This greater margin, if available, would also permit the central station to make a profit in merchandising, and thus take away the principal criticism against those utilities which are now operating this department at a loss.

It may be argued that an increase in selling price, if found necessary, would offer sales resistance. I do not believe this would affect sales in any way if price adjustments upward were made universally. In our own experience we have seen prices on electric ranges raised from little above cost to list in two price changes without affecting sales.

Just recently eight of our principal home-furnishing dealers in meeting were interviewed for the purpose of determining their attitude toward the sale of electric ranges. Through this group probably 90 per cent of all the equipment going into the homes of Portland is sold. With the exception of one dealer, all were pushing gas range sales in preference to electric. However, in face of this attitude, the dealers are putting on the lines of the power company one-third of the total ranges connected each year. The total yearly connects from all sources amount to approximately 3,000 electric ranges and the total now in operation is about 22,000, or a saturation approaching 30 per cent.

There is little doubt in my mind that the sales actually made each year by the dealers are very largely a result of popular demand by the purchaser for the electric range built up by the power company and through so many satisfied users, rather than through any particular effort on the part of the dealer. What a difference there would be in the total number of electric ranges sold in Portland each year if every dealer said to the prospective range purchaser, "Yes, this electric range is the cooking device you should buy." One does not have to draw on his imagination very much to marvel at the number of

electric ranges actually sold each year in Portland, Ore., when it is known that 98 contacts out of each 100 made by the prospective range buyer with the dealer are known to be favorable to the gas range, if not absolutely opposed to the electric. I may say that I believe dealer conditions in Portland are far more favorable to the electric range than is to be found in most other cities of the United States.

What a real opportunity we have to build load on our lines with the help of all dealers, but what a slow job it is going to be if we continue to do it all alone.

▼

Federal Trade Report Shows More Interstate Energy

Electric power is moving across state and national boundaries in increasing volume and conditions seem to point to future expansion in long-distance transmission and a resulting disregard of state lines in the supply of electricity, according to the Federal Trade Commission in the final report of its investigation on interstate power transmission which was sent to the Senate recently.

There is considerable difference between some of the results shown in the commission's report and the figures compiled by the National Electric Light Association for 1929, but the federal commission contends that the difference is practically a matter of method and basis. An explanation of the differences between the two studies may be seen in correspondence exchanged between the association and the commission, which is incorporated in the report.

The gross ratio of quantities exported across state lines to quantities generated during 1929 (for the 48 states and District of Columbia) was 15.18 per cent. The gross ratio of quantities imported to quantities consumed was 19.64 per cent. Difference between the two ratios is partly due to losses between points of generation and consumption, which reduce the total quantity received by consumers by as much as 15,000,000,000 kw.-hr.

The size of the imports ratio is also affected by the fact that imports over international boundaries into the United States are 1,400,000,000 kw.-hr. in excess of exports. Aside from this difference between exports to and imports from Canada and Mexico the aggregate for exports and imports across the boundaries between states is identical, since exports of one state are imports of another. After excluding railroad operations, the ratio of exported to generated electricity becomes 15.41 per cent and that of imported to consumed electricity 21.49 per cent for the United States as a whole. Exclusion of certain figures for municipal and governmental plants would, it is said, further increase these ratios of exports to generated.

Movement Across State Boundaries

A summary of the movement of electrical energy across state boundries (including those of the District of Columbia) for the United States as a whole (excluding Alaska and outlying possessions) and total ratios for 1929:

	Kilowatt-Hours
Outward movement across state boundaries	14,505,190,623
Inward movement across state boundaries	15,906,132,127
Total electric energy generated in the United States	95,582,144,161
Total electric energy consumed in the United States	80,968,440,669
Ratio of outward movement to generated	15.18 per cent
Ratio of inward movement to consumed	19.64 per cent
Reconciliation of outward with inward movement:	
Inward movement	15,906,132,127
Outward movement	14,505,190,623
Difference	1,400,941,504
Exports to Canada and Mexico included in outward movement	37,552,487
Imports from Canada and Mexico included in inward movement	1,438,493,991
Difference	1,400,941,504

▼

Circuit and Meter Identifications Required

Confusion and error by any one seeking to identify particular meters or service boxes in multiple installations may be greatly reduced by utility insistence upon clearly defined markings. The New York Edison system in its "Information and Requirements for the Supply of Electric Service" states:

"In buildings where more than one meter is installed, each meter circuit shall be tagged to indicate exactly the portion of the building supplied. In addition, the consumer shall mark similar designation with white paint in a permanent and legible manner on the face of the endline boxes and meter equipments. Stenciled characters ¾ in. to 1½ in. in height are recommended."

Outward and Inward Movement Across State Boundaries

(1929)

Group of States	Generated	Consumed	Interstate Movement — Outward	Interstate Movement — Inward
New England	6,537,946	5,268,597	1,826,651	1,823,368
Middle Atlantic	24,211,767	23,050,870	1,379,237	4,188,352
East North Central	23,050,653	19,028,771	2,885,238	2,154,648
West North Central	5,746,239	5,293,988	896,926	1,697,203
South Atlantic	11,275,098	7,559,391	4,946,617	2,807,428
East South Central	3,556,323	3,582,208	823,421	1,527,277
West South Central	4,801,853	4,247,386	633,058	620,512
Mountain	3,985,477	3,683,010	605,338	831,032
Pacific	12,416,788	9,254,220	508,705	256,312
Total United States	95,582,144	80,968,441	14,505,191	15,906,132

Southeastern States Show Highest Regional Ratios

	Ratios (per Cent) — Outward Movement to Generated	Ratios (per Cent) — Inward Movement to Consumed
New England	27.94	34.60
Middle Atlantic	5.70	18.17
East North Central	12.52	11.32
West North Central	15.61	32.06
South Atlantic	43.87	37.14
East South Central	23.15	42.64
West South Central	13.18	14.61
Mountain	15.19	22.56
Pacific	4.10	2.77
Total United States	15.18	19.64

A.C. Network Adopted for Toledo

—23-kv. radial feeders and four-wire secondary network
—Combined light and power service
—4,000-volt substation installation eliminated
—250,000-circ.mil cables and No. 4/0 bare neutral used

By A. HOEFLE

Engineer the Toledo Edison Company, Toledo Ohio

THE Toledo Edison Company has adopted as its standard for future downtown development the four-wire alternating-current secondary network system of distribution with radial type primary feeders. Leading up to this final decision were many factors, which are briefly outlined below:

Until early in 1923 the downtown area of Toledo was served almost entirely by the familiar Edison direct-current three-wire system supplied by two rotary substations. By 1923 the d.c. supply equipment was well loaded and the policy was adopted of adding all new loads on a.c. No further increase was permitted in the d.c. load and considerable co-operation was given to changeovers whenever possible.

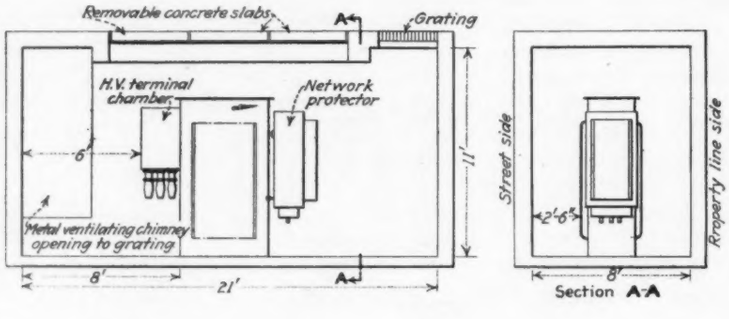
At this point it should be stated that up to 1923 no outstanding method of downtown a.c. distribution had been developed. Various companies were trying different schemes of their own, mostly adaptations of methods used in the aerial districts. These methods included loop feeders, duplicate radial feeders with a throwover arrangement at the customers' premises, simple radial feeders with radial secondaries, and a combination of such ideas. The four-wire secondary network designed along its present lines was receiving its initial trial about this time in New York City. It was not until three or four years later that this system began to attract attention.

Now to return to Toledo in 1923. In the downtown underground area an a.c. system patterned along the lines of that used in the aerial districts was started. The major difference in the underground scheme is that the feeders are laid out as loops; 4,000-volt, three-conductor cables are looped into large customer substations and these supply the customers' requirements only. Miscellaneous small power and light requirements are supplied by transformers installed in sidewalk vaults. Radial type secondaries are used and consist of single-phase, 115/230-volt, three-wire lighting mains and three-phase, 460-volt power mains, thereby conforming to practice in the aerial districts.

Until recently the foregoing plan of development has been followed substantially as outlined. Some thought was given to establishing secondary networks by tying together the secondaries of the vault transformers. If this had been done there would have been four distinct networks, namely, three single-phase lighting grids, one on each phase, and one three-phase, 460-volt power grid.

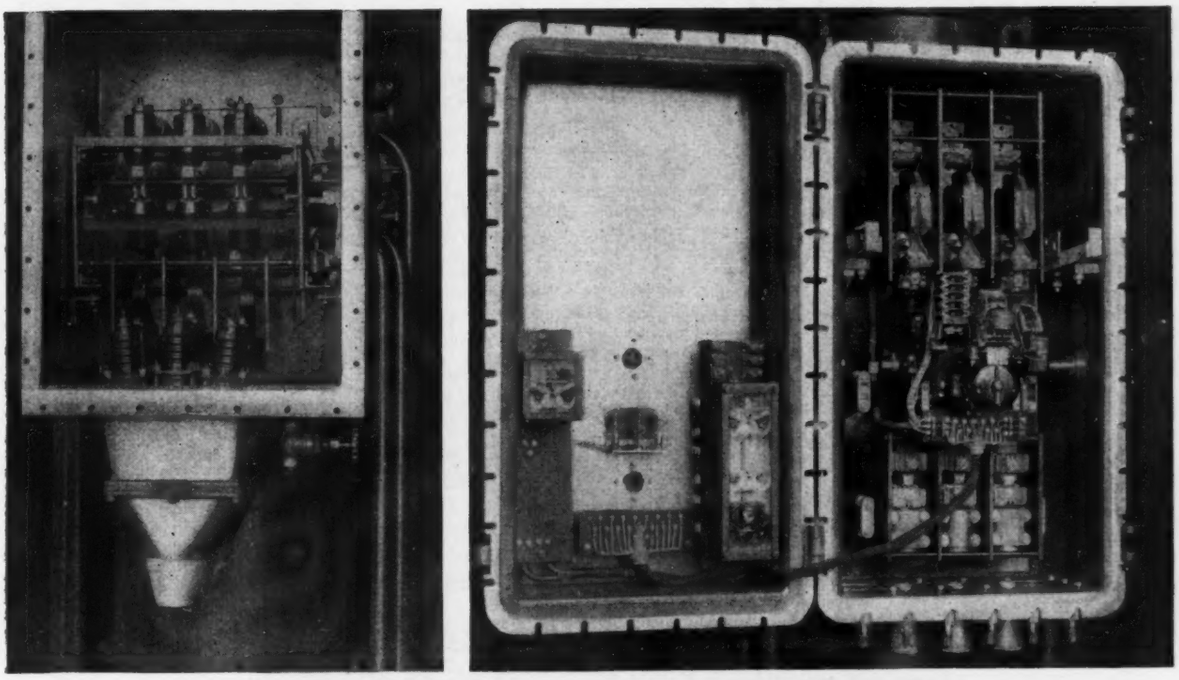
Further investigation of this idea resulted in reopening the entire matter of underground a.c. distribution for Toledo in the light of the latest practice and experience in other cities. A large number of plans were given preliminary analysis, and by a process of elimination six were selected for detailed study. These six plans were based on supplying 30,000 kw. fifteen years hence. The desirable characteristics sought included:

1. Continuous service to all customers.
2. Flexibility and ease of expansion.
3. Economy in investment and operation.



Typical sidewalk transformer vault

Three-piece removable concrete slabs in sidewalk permit hoisting of high-voltage terminal, transformer, and protector individually or collectively. Metal chimney leading to one sidewalk grating stimulates natural ventilation.

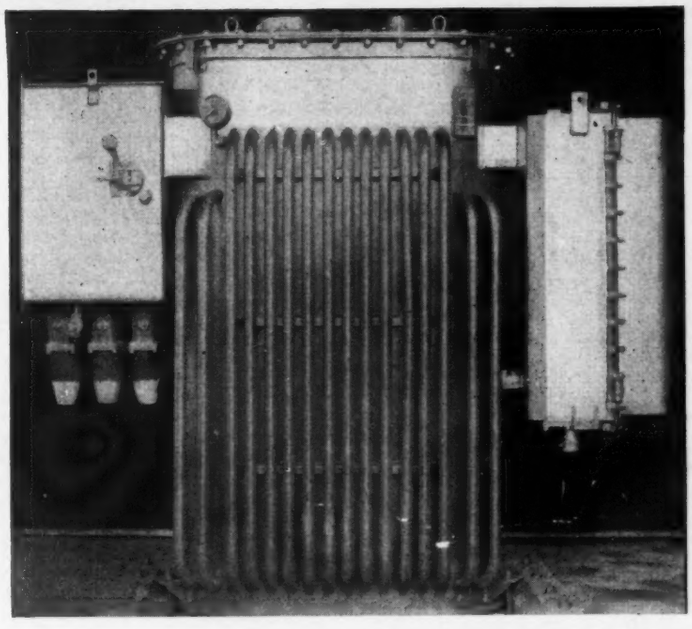


General Electric Company

The three-phase, 450-kva. transformer has a high voltage terminal on the left and a 1,600-amp. network protector on the right, both of which are removable.

The high-tension terminal chamber contains a three-position switch, the purpose of which is shown in the schematic diagram. Note the three-conductor pothead.

Submersible case of network protector is opened to show motor-operated unit. Note connections between protector and transformer. Neutral lug on left.



Network transformer with its high-tension terminal chamber and protector

A brief outline and discussion of each of the six plans selected is given in the panel which appears on page 108.

A set of detailed estimated costs of each plan completely installed suitable for supplying the assumed load of 30,000 kw. was made. The figures are based on somewhat ideal conditions, in which no attention was paid to existing d.c. or a.c. systems. The table on page 109 summarizes this cost data and is expressed in per cent of the total for Plan IV.

A careful study of all the general data and of purely local operating conditions led to the decision to eliminate all plans except IV and V. These two were then analyzed in still greater detail, taking into consideration year by year expenditures, carrying charges, and to a certain extent the existing distribution systems in the downtown area. The final selection was Plan IV, which calls for 23-kv. radial feeders and the four-wire secondary network.

Inasmuch as actual construction on the new system was not started until June, 1930, the actual physical extent of the network at this writing is small indeed.

The primary system consists of two radial type feeders operating at 23,000 volts. The cable is three-conductor, of the shielded type, having No. 2/0 round conductors and $\frac{33}{64}$-in. paper insulation. Joints on this cable are of the type in which the metal tape has been reapplied to the re-formed joint insulation. A medium hard compound is used for filling the joint.

Network transformers for the Toledo system are

Alternative Distribution Plan for Toledo

Plan I

This is the ultimate toward which recent construction in the underground a.c. system in Toledo was working. The features are:

(a) Three single-phase, three-wire lighting networks, one on each phase and operating at 115/230 volts.

(b) One three-phase network supplying power at 460 volts.

(c) Customer substations for bulk loads fed and metered at primary voltage and intended for the customers' load exclusively.

(d) Primary 4,000-volt loop type feeders. These were looped through every connection consisting of primary customers and transformer vaults. The latter are located under the sidewalk and contain power and light banks to supply the secondary grids. Automatic sectionalizing of the loop feeders are included in this plan, as are network protectors.

The outstanding advantages of this plan are:

1. Light and power voltages conforming to the remainder of the territory.
2. Light and power on separate secondaries and transformers.
3. Reduced area affected in the event of a primary cable fault.

The outstanding disadvantages of this plan are:

1. Inefficient use of cable in loop feeders.
2. Low primary voltage requires many feeders and adds to regulation problem.
3. Load is split into five parts, namely, primary customers, power grid, and three lighting grids. Little advantage can be obtained of equipment diversity.
4. Cable and duct congestion is high.
5. Requires a new 4,000-volt substation in addition to the existing Water Street station.
6. Complicated and expensive primary loop protective equipment is required.

Plan II

(a) Three single-phase lighting networks.

(b) One three-phase power network.

(c) No primary customers, all load metered secondary.

(d) 4,000-volt radial type feeders.

This plan resembles Plan I, but is intended to overcome the objections to the loop feeder and its sectionalizing problems. Since radial feeders are used, two-way feed is no longer practicable to primary customers, so it is omitted in this plan. The advantages of this plan are the same as for Plan I excepting item 3. The disadvantages are less, being as follows:

1. Low primary voltage.
2. Load is split into four parts, namely, one power grid and three lighting grids. Better diversity is obtained than in Plan I, but it is still not good.
3. Cable and duct congestion is high.
4. Requires a new 4,000-volt substation.

Plan III

(a) One three-phase, four-wire combined light and power secondary network, voltages to be on the order of 120/208 Y.

(b) 4,000-volt radial feeders.

This plan differs radically from the preceding plans and is laid out along lines in general use on many a.c. network systems. The advantages of this plan include:

1. Combined light and power secondary takes advantage of the diversity between all loads. A high factor of equipment utilization is the result.
2. Simplified vault layout.
3. Expansion both easy and flexible.

Disadvantages of the plan include:

1. Odd power voltage.
2. Combined light and power secondaries introduce flicker possibilities.
3. Low primary voltage.
4. Requires a new 4,000-volt substation.

Plan IV

(a) One three-phase, four-wire secondary network.

(b) 23,000-volt radial feeders.

This plan brings about an outstanding saving in the elimination of the need for a new 4,000-kv. substation due to the use of 23,000-volt feeders. The advantages of this plan are the same as for Plan III and in addition may be added:

4. High primary voltage helps the regulation problem and has least effect in increasing cable and duct congestion.
5. Makes a new 4,000-kv. substation unnecessary.

The disadvantages of this plan are:

1. Odd power voltage.
2. Flicker possibilities of combined secondary.

Plan V

(a) One three-phase, four-wire secondary network.

(b) 4,000-volt radial feeders, supplemented by 23,000-volt radial feeders.

This plan would use 4,000-volt feeders up to the point where a new 4,000-volt substation became necessary and then take on all additional network load with 23-kv. feeders. The advantages of this plan are the same as for Plan IV and in addition may be added:

6. Makes immediate use of existing 4-kv. capacity.

The disadvantages of this plan are the same as in Plan IV and in addition may be added:

3. Introduces a problem of phase displacement and rotation due to the extra transformation which the 4-kv. system undergoes.
4. Ties up 4-kv. substation capacity that may be needed soon for other purposes.

Plan VI

(a) One three-phase, four-wire secondary network.

(b) 13,200-volt radial feeders supplied by individual feeder auto-transformers off the 23,000-volt bus at Water Street station. The auto-transformer is considered an integral part of each feeder.

This plan endeavors to use 13.2-kv. feeder cables and network transformers rather than 23-kv. cables and transformers, having in mind the lower cost of the 13.2-kv. equipment. The advantages of this plan are the same as those of Plan V. The disadvantages are the same as for Plan IV and in addition may be added:

3. Cable and duct congestion greater due to lower voltage.
4. Unable to extend feeders to other existing 23-kv. sources without other auto-transformers.
5. Limited space at Water Street station for auto-transformers.
6. There being no 13.2-kv. bus (or room for one) each feeder is dependent on only one auto-transformer—not a reliable operating condition.

450-kva., three-phase units with four 2½ per cent taps in the high-voltage winding. Externally operated ratio adjusters are provided. The inherent impedance is normal, being about 5 per cent. If a higher impedance is deemed necessary, external cable type reactors will be installed. On the high-voltage end of the transformer tank there is a terminal chamber with three three-conductor high-voltage potheads. This arrangement is intended to avoid "T" joints in the 23-kv. cables. For instance, a primary feeder may be brought in to one pothead and the same feeder can be continued up the street by connecting onto another pothead. The third pothead is available in case it is desired to extend the feeder down a side street or alley to another similar transformer. These potheads are filled with a hard compound and connect with the oil-filled terminal chamber by means of porcelain bushings.

Inside the terminal chamber all the conductors of the same phase are bused together. Off this bus a connection is made to the transformer windings through an externally operated high-voltage switch. This switch is really a disconnect immersed in oil and is used to gain flexibility and safety in maintenance work on the primary equipment. Three positions are available on the switch, namely, "close," "open" and "ground." Suitable electrical and mechanical interlocks are provided to guard against improper manipulation of the switch. The entire high-voltage terminal chamber, including switch and potheads, may be removed from the transformer.

Low-voltage terminals of the transformer consist of

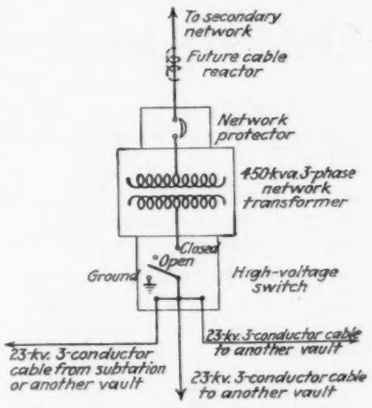
three porcelain bushings arranged with flexible copper terminals. The three bushings are surrounded with a wide flanged collar so that a suitably matched collar may be bolted to it. The neutral terminal consists of a copper lug brought out near the base of the tank and grounded thereto.

The network protector is mounted in a case, on the rear of which is a flanged collar that matches the collar on the transformer, thereby permitting the protector case to be bolted to the transformer tank. Suitable bracing is arranged near the bottom of the protector case, which permits the latter to be even more firmly supported. The upper terminals of the protector circuit extend through the protector case and match up with the corresponding transformer terminals. The flexibility of the transformer terminal makes it comparatively easy to line up the bolt holes and eases any possible mechanical strain on the transformer bushings. Access to the inside of the transformer tank is not necessary to mount or remove the protector or its case. Connections to the network are brought out at the bottom of the protector case by means of three single-conductor wiping sleeves. The combined transformer and protector when completely assembled is entirely submersible.

The network protector itself is essentially the same as the usual separately mounted type except for the change made necessary by the fact that normal current flow is in the reverse direction through the protector. The 1,600-amp. size is used and is supplied with trip-free, motor-operated reclosing mechanism and the standard network and phasing relays.

Transformer vaults are variously located, some being under the sidewalk. Three removable concrete slabs are provided in the roof of the sidewalk vaults for lowering or raising vault equipment. If the network protector or high-voltage terminal chamber alone need to be removed only one slab is raised. All three slabs removed at the same time permits lowering a complete transformer with its protector. Two openings with gratings, located in opposite corners, provide ventilation. One opening has a metal chimney or draft tube extending from the sidewalk level to about 2 ft. from the vault floor. This sets up a chimney effect that provides natural draft.

Equipment layout and vault wiring are reduced to very simple terms, since three-phase transformers are used with direct-mounted protectors. All that is needed on the high-voltage end is a single wiped connection between cable and pothead. On the low-voltage end the network connection to the protector is made with three single-conductor, 2,000,000-circ.mil, lead-covered cables. About midway between the protector and the street duct entrance each large cable is fanned out to the smaller sized cables used in the street system. The large cable is used for convenience in installing cable type reactors if that becomes desirable.



Essential elements of vault installation

The secondary network in the streets consists of mains made up of three single-conductor, 250,000-circ.mil, lead-covered cables and a No. 4/0 bare neutral. Where additional capacity is required more than one main will be installed and connected in parallel. All four conductors comprising a main are installed in a single duct.

Nominal secondary voltage at the customers' service is 120/208 Y. Inasmuch as the network load curve closely resembles the total Toledo Edison system load curve, regulation is improved by a variation at regular intervals each day of the generator bus voltage. The

Comparison of Cost Data on Six Plans

(Expressed in Per Cent of Total for Plan IV)

Item	Plan I 4-Kv. Loops Prim. Cust. 3 1-Ph. Light Nets, 1 3-Ph. Power Net, 460-Volt	Plan II 4-Kv. Radial No Prim. Cust. 3 1-Ph. Light Nets, 1 3-Ph Power Net, 460-Volt	Plan III 4-Kv. Radial 3-Ph., 4-Wire Network	Plan IV 23-Kv. Radial 4-Wire Network	Plan V 4 and 23-Kv. Radial 3-Ph., 4-Wire Network	Plan VI 13.2-Kv. Radial 3-Ph., 4-Wire Network
Primary cables	23.2	12.9	11.9	11.2	12.3	10.9
Secondary cables	22.2	23.5	19.4	19.4	19.4	19.4
Transformers	11.4	20.2	21.6	30.4	27.8	27.9
Vaults	15.8	8.3	8.3	8.3	8.3	8.3
Duct allocation	14.7	13.5	9.8	8.9	9.4	10.2
Network protectors	9.8	19.7	15.0	15.0	15.0	15.0
Junction boxes and fuses	3.4	3.4	.....	.....	.....	.....
Pro rata old substation	3.3	7.1	7.1	2.2	8.8	3.4
Pro rata supply to old substation	0.3	0.6	0.6	1.8	1.8	1.8
Pro rata new substation	17.3	16.3	16.3	.....	.....	.....
Pro rata supply to new substation	3.3	2.7	2.7	.....	.....	.....
Substation feeder switches	13.6	6.3	6.3	2.5	3.6	4.4
Secondary cable reactors	0.1	0.2	0.3	0.3	0.3	0.3
Oil disconnects	5.4	.....	.....	.....	.....	.....
Sectionalizing equipment	9.9	.....	.....	.....	.....	.....
Auto-transformers	.....	.....	.....	.....	.....	4.2
Total	153.7	134.7	119.3	100.0	106.7	105.8
Number of feeders	28	26	26	7	13	12
Miles of feeder cable	46.5	31.4	28.3	23.8	27.3	30.8
Miles of duct required	93.5	86.5	62.8	56.6	60.0	65.5

23,000-volt bus at Water Street station is supplied by a stepdown from a 69,000-volt transmission system. As a part of the ultimate plan it is proposed to sectionalize the 23,000-volt bus at Water Street and connect all network feeders to that section. That bus section will then be supplied by a step-down transformer which is equipped with ratio adjusters.

▼

Neon Tubes Make Inexpensive Ground Detector

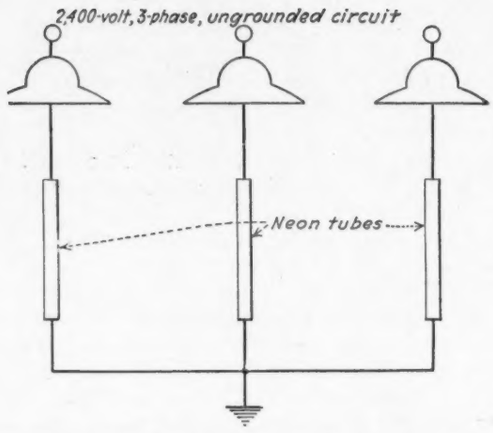
By H. P. CURRIN
Electrical Engineer Eugene Water Board, Eugene, Ore.

Inability to detect accidental grounds on the 2,400-volt delta distribution system of the city of Eugene and the expense of installing standard ground detectors led to experiments to find an inexpensive, yet reliable, detector. Short sections of neon tubes with porcelain insulators for supplying exciting current proved quite satisfactory.

Using Locke No. 5,800 insulators (old chipped insulators are quite satisfactory) for condensers, the ground detector is made up in the manner illustrated. The tubes chosen are about ½ in. in diameter with a 1-in. separation of electrodes and are made to specifications by a local sign works. Red proved more desirable than blue because of greater brilliance. There is sufficient charging current through the insulators and tubes to ground to cause the tubes to glow lightly, but with enough brilliance to show up in a dark location. Under these conditions the tubes should have a long life.

The tubes are mounted on the inside of a switch house at each substation, but it is quite possible to mount the insulators on the bus outside and run wires through the wall to the tubes. A ¼-in. peekhole was drilled through the steel door at each switch house and the tubes show up well even on the brightest day.

Tests on the tubes show that they will glow when



Ground detector uses neon tubes and old insulators

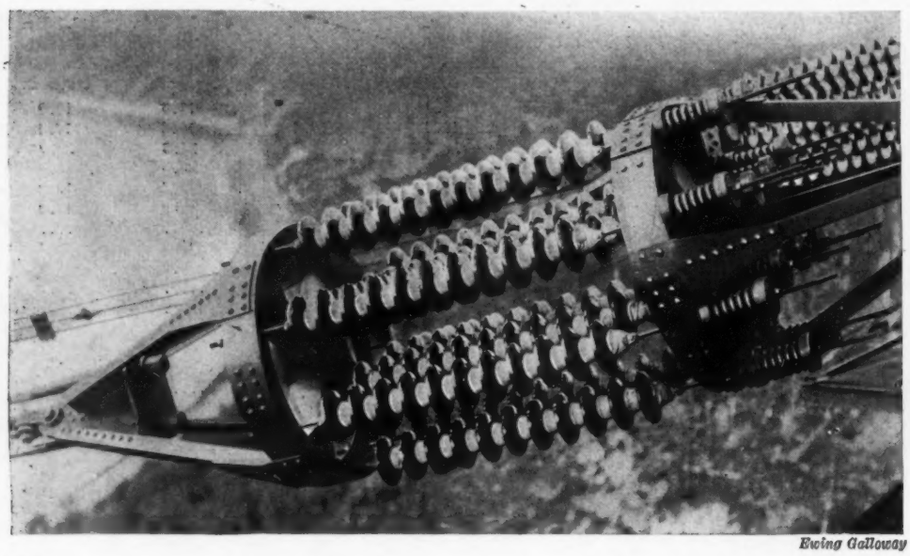
500 volts or over is impressed across them. Below this voltage they are extinguished. As the normal voltage to ground on a 2,400-volt, three-phase delta circuit is about 1,390 volts, it is evident that if one tube is extinguished there is a ground on the corresponding phase or the tube is defective. Either condition calls for an investigation. Obviously the cost of such a ground detector is very nominal indeed.

▼

Mercury Turbine Averages 10,310 B.t.u./Kw.-Hr.

"Between February 4 and Dec. 14, 1930, inclusive, the mercury boiler and turbo-generator unit at the South Meadow station of the Hartford Electric Light Company produced a total net output of 112,238,940 kw.-hr. at an average rate of 10,310 B.t.u. The unit was available for service 82.3 per cent of the time allowing for all causes of shut-down and 95.1 per cent of the time de-

▼ ▼ ▼



Ewing Galloway

Dead-End Stress Divided Among Ten Insulator Strings

This spring - equalized and swivel-mounted dead-end assembly insures even distribution of load over the ten strings of eleven insulators per string at the Cushman hydro - electric project of the city of Tacoma, Wash. The span crosses Puget Sound at 110,000 volts with a length of more than 6,000 ft.

ducting mercury causes only," announced Vice-President T. H. Soren of the Hartford company at the recent meeting of the Connecticut section of the American Institute of Electrical Engineers.

The energy obtained from the mercury-driven generator itself is secured at a rate of about 4,000 B.t.u. per kilowatt-hour. On test the complete unit delivered energy at 9,800 B.t.u., including electricity and steam supplied. There should be no reason for excessive initial costs in future units designed from well-tried materials and produced under the advantages of regular manufacturing conditions, Mr. Soren declared. The supply of mercury is at present obtained on what might be called a laboratory scale, but the resources of the world in cinnabar deposits and opportunities of a future wider market should insure commercial supply on a power production scale. Very little mercury has been lost in the development at Hartford, and with around 9 lb. of steam per kilowatt-hour at hand the further outlook seems most attractive and bound to push high-pressure steam development closely.

Irving E. Moultrop, chief engineer of the Edison Electric Illuminating Company of Boston, shared the platform with Mr. Soren, and after recounting the problems faced by the designers of the Edgar station at Boston, culminating in the successful combination of

Ten Months' Run of Mercury Unit Gives 0.715 Lb. Coal per Kilowatt-Hour

South Meadow Station,
Hartford Electric Light Company

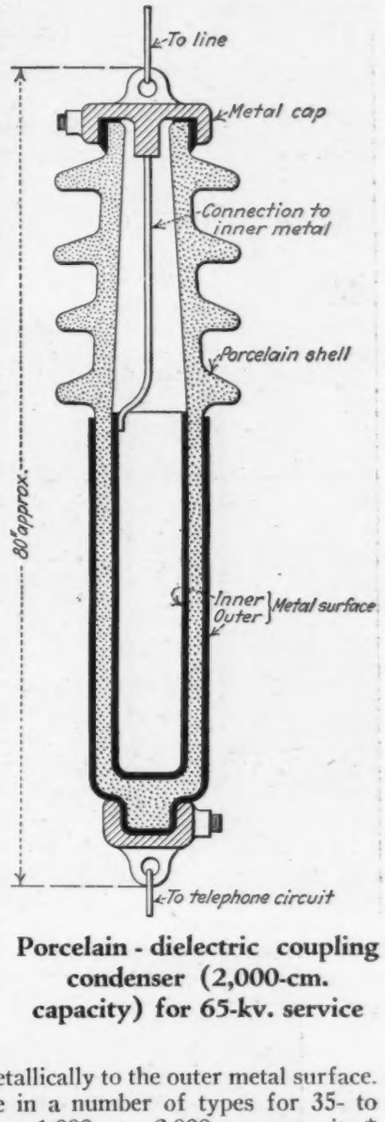
Operation began	Feb. 4, 1930
End of period	Dec. 14, 1930
Lb. coal burned	80,261,010
Lb. steam generated	661,388,000
Kw.-hr. generated by mercury generator	48,694,000
Kw.-hr. equivalent steam generated from mercury condenser	65,781,260
Kw.-hr. station service	2,236,320
Kw.-hr. total net output	112,238,940
Coal rate—lb. per kw.-hr. net	0.7151
Coal analysis—B.t.u. as fired	14,420
B.t.u. per kw.-hr. net	10,310
Hours turbo-generator operated	5,749
Total hours in operating period	7,520
Mercury generator peak in kw.	10,500
Load-factor, mercury generator (per cent)	61.7
Availability Factors:	
Hours out of service, mercury causes	369
Availability, mercury causes only (per cent)	95.1
Hours out of service, all causes	1,334
Availability, considering all causes (per cent)	82.3

1,200-lb. equipment with lower-pressure prime mover service and a record of close to 1 lb. of coal per kilowatt-hour, he expressed his confidence in the future of the mercury process, provided costs of construction and installation allow its more general use.

"Today," said Mr. Moultrop, "we have about 25,000 kw. in 1,200-lb. units installed at Edgar station, including five high-pressure boilers, and our next addition will probably be along the same line, combining high and lower pressure equipment in a proportion to insure economical operation. We reached a plant economy of 14,000 B.t.u. with the first installation, and are obtaining around 13,500 B.t.u. today despite the lack of balance between the high- and low-pressure equipment. The new Gilbert station at Holland, N. J., has already touched 12,000 B.t.u., and Deepwater is in the same class. Still further economies may be expected when these plants are properly broken in. I look to see this figure go to around 11,500 B.t.u. in steam practice, but further advances will depend on the metallurgist's ability to produce commercial material suited to higher temperatures."

Porcelain Condenser for Carrier-Current Coupling

Various types of special condensers with air, oil, porcelain and fibrous dielectrics are in use for coupling purposes in carrier-current systems. In the No. 22, Vol. 38 issue of the *Keramische Rundschau* (Germany) is described a new porcelain coupling condenser which appears similar to a one-piece porcelain bushing. The upper part is equipped with rain-shedding petticoats, but the smooth, cylindrical lower part is closed at the bottom. Inside and outside the cylindrical part is a strongly adhering metal coating, the two coatings forming the electrodes of the condenser, while the shell of porcelain between them acts as the dielectric. A metal cap cemented to the top of the bushing seals it hermetically and makes connection to the inner metal coating. A similar metal cap at the bottom connects metallically to the outer metal surface.



Porcelain-dielectric coupling condenser (2,000-cm. capacity) for 65-kv. service

The units are made in a number of types for 35- to 65-kv. service and for 1,000- to 2,000-cm. capacity.* For higher voltages chains can be formed from two or more of such units in series.

When finished, these condensers are subjected to an exceptionally high voltage test, which is 97 kv. for the 35-kv. type and 163 kv. for the 65-kv. type. Following this, each unit must pass a mechanical pulling test of 5,000 lb. between its metal caps. The rated capacitance is guaranteed to within plus or minus 5 per cent by the manufacturer.

The accompanying sketch gives a diagrammatic cross-section, together with general dimensions, of a 65-kv. unit. From this it can be seen that the porcelain is stressed electrically chiefly on puncture, with a very generous creepage path across the four petticoats between poles.

**One centimeter, as a unit of capacity, is equal to 10^{-12} farad.*

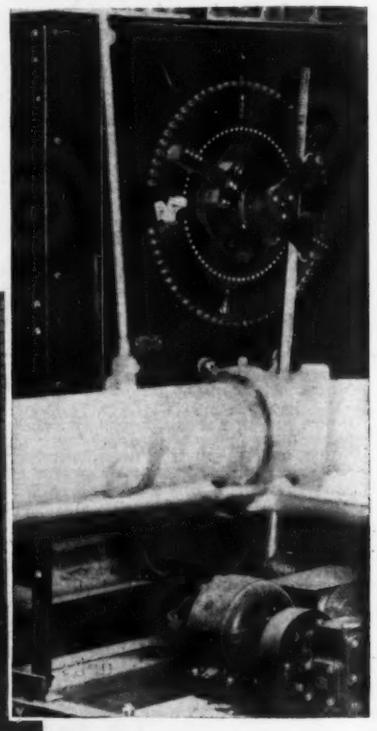
Mobile-Color Floodlighting

By KARR PARKER

Engineering Manager McCarthy Brothers & Ford, Buffalo, N. Y.

THE new Rand Building, which is the tallest building in Buffalo, is 420 ft. high to the top of the tower. It is a 28-story office structure and has the most elaborate and complete electrical installation of any building in Buffalo. There are 7,564 lighting outlets involved here, requiring a total of 125,700 ft. of conduit and more than 500,000 ft. of wire. It is the first office building in Buffalo to have an under-floor conduit system, permitting electrical connections to desks to be made anywhere in the structure at any time. The entire build-

Rand Building at night, showing floodlighted tower and neon air beacon



Special motor-driven dimmer for controlling the three-phase, 25-cycle, 115-volt, four-wire circuits to the floodlights

View of floodlights on eighteenth floor level. In oval, typical assembly of floodlights on corner of tower

ing carries an average of 4½ watts of light for each square foot of space. Westinghouse "Sol-Lux" luminaires are used throughout. The banking offices have specially designed units in modernistic effects.

Floodlighting panorama

Mobile colored floodlighting is used to make the building a moving panorama of colors in red, white and blue. This was the first installation of its kind in the United States. The building is floodlighted from the eighteenth to the twenty-eighth floor, using Westinghouse type CA projectors with special lenses and color screens. At the eighteenth floor deck is the first setback, making possible the placing of the floodlighting unit. Eighteen 1,000-watt projectors are used, throwing a pure white light on the building, and 36 1,000-watt blue lights are also used at this point. The second setback occurs at the 21st floor and projectors are arranged so the light is thrown more than 90 ft. upward on the building. Fifty-one red lights and 36 white lights of 1,000 watts each are placed at this position as well as 21 white lamps and 26 red lamps of 500 watts each.

On the eighteenth floor the light changes from a very deep blue through all shades of blue to white, then through all shades of blue back to white. The cycle of the colors on this deck requires 240 seconds in the change. A special dimmer of unique design is used.

The red and white lights of the second deck, which are thrown on the tower of the building, rotate through all shades, from the deep red through to the palest pink coral to white, and back again through the same cycle of colors, requiring only 120 seconds in this change, or twice as fast as the cycle of colors moves on the first deck.

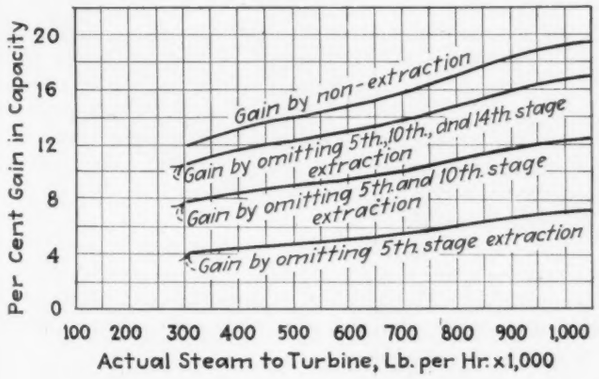
A neon air beacon is located on the tower. This beacon is topped by a fixed airway projector, throwing a 3,000,000-cp. beam toward the Buffalo Airport. There is also a 3,000,000-cp. white beam above that, which revolves twice per minute and throws a beam into the sky at 2 deg. elevation.

▼

Non-Extraction Raises Capacity 20 per Cent

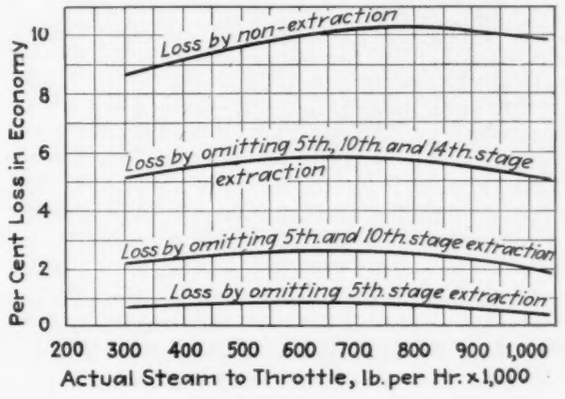
Tests made on a 94,000-kw. turbo-generator in December, 1928, showed that a gain of 12 to almost 20 per cent in capacity could be obtained by omitting steam extraction at all stages and that the per cent loss in economy effected by such non-extraction varied from 8.7 per cent to 10.3 per cent, according to a report of the prime movers committee of N.E.L.A.

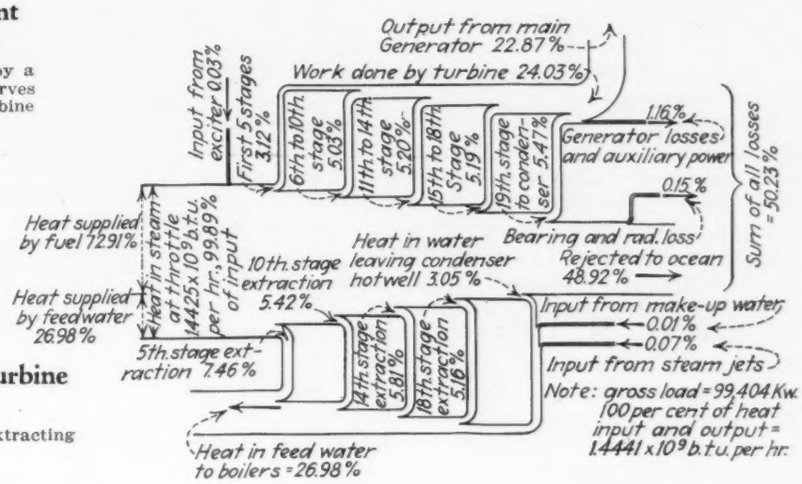
The turbine tested was a General Electric machine with the following characteristics: 1,500 r.p.m., two-cylinder, tandem-compound with double-flow low-pressure cylinder; eighteen stages in high-pressure cylinder and three stages in low-pressure cylinder; steam extracted from fifth, tenth, fourteenth and eighteenth stages; load at best thermal efficiency 78,000 kw. The throttle pressure was 400 lb. gage, and the steam temperature 725 deg. F.


Per Cent Gain in Capacity
0
4
8
12
16
20
Gain by non-extraction
Gain by omitting 5th., 10th., and 14th. stage extraction
Gain by omitting 5th. and 10th. stage extraction
Gain by omitting 5th. stage extraction
100 200 300 400 500 600 700 800 900 1,000
Actual Steam to Turbine, Lb. per Hr. x 1,000

Gain in capacity of 20 per cent obtained by non-extraction

This gain in capacity is accompanied by a 9 per cent loss in economy. These curves are from test data on a 94,000-kw. turbine with four stages of extraction.


Per Cent Loss in Economy
0
2
4
6
8
10
Loss by non-extraction
Loss by omitting 5th., 10th. and 14th. stage extraction
Loss by omitting 5th. and 10th. stage extraction
Loss by omitting 5th. stage extraction
200 300 400 500 600 700 800 900 1,000
Actual Steam to Throttle, lb. per Hr. x 1,000


Output from main Generator 22.87%
Work done by turbine 24.03%
Input from exciter 0.03%
First 5 stages 3.12%
6th to 10th stage 5.03%
11th to 14th stage 5.20%
15th to 18th Stage 5.19%
19th stage to condenser 5.47%
1.16%
Generator losses and auxiliary power
0.15%
Bearing and rad. loss
Rejected to ocean 48.92%
Sum of all losses = 50.23%
Heat supplied by fuel 72.91%
Heat in steam at throttle 14425 x 10⁹ b.t.u. per hr., 99.89% of input
Heat in water leaving condenser hotwell 3.05%
Heat supplied by feedwater 26.98%
10th. stage extraction 5.42%
Input from make-up water
0.01%
0.07%
Input from steam jets
5th. stage extraction 7.46%
14th. stage extraction 5.81%
18th. stage extraction 5.16%
Note: gross load = 99,404 Kw. 100 per cent of heat input and output = 1.4441 x 10⁹ b.t.u. per hr.
Heat in feed water to boilers = 26.98%

Normal heat balance of turbine used for tests

Data cover a 94,000-kw. turbine extracting steam from four stages.

READERS' FORUM

Value of Grounding Should Be Based on Comparable Facts

To the Editor of the ELECTRICAL WORLD:

In the editorial which appeared in the September 20 issue of ELECTRICAL WORLD entitled "Lightning Interruptions Are Still on the Increase," based on the report of the operation of transmission lines made by the Great Lakes Division overhead systems committee for the year 1929, certain conclusions from this report are stated which, if taken for their face value, without study of the report, appear to be questionable and, for those who do not trouble themselves to investigate further, may lead to incorrect conclusions on their part.

1. It is stated that the efficacy of grounding supports in comparison with not grounding is shown in the ratio of the indexed figures for lightning flashovers per 100 miles of 7.0 for grounded structures and 9.1 for ungrounded structures.

Attention is directed to the fact that the latter figure is based on one line only with a mileage of 77.3, as against 142 lines of the grounded class, with a total mileage of 2,581. No recognition is given to the fact that a large number of lines under the class of grounded structures had interruptions per 100 miles of line due to lightning flashovers much in excess of the average of 7.0. Neither does the comparison take into account other differences in the design or construction of the lines compared, which might have more influence upon the difference in performance than the matter of grounding or not grounding of the structures. The basic theory under which grounded and non-grounded structures may be compared in lightning performance indicates a conclusion opposite from that stated in the editorial and the two index figures given are so nearly the same that the conclusions as to difference in performance from these figures do not seem warranted.

2. It is pointed out that for the lower voltage lines, between 30 and 60 kv., the interruptions per 100 miles are twice as frequent on ungrounded lines as on grounded lines, inferring that this indicates more satisfactory operation with respect to lightning for the lines with grounded structures.

Again no recognition is given to the fact that the total mileage for the lines with grounded structures reported on is 165, in comparison with 3,495 miles of lines with ungrounded structures. I should like to call attention also, in this case, to the fact that for certain of the lines with grounded structures the trip-outs due to lightning per 100 miles are as high as 133.6, in comparison with the average of 17.6. It is probable that the lightning performance of the lines of both classes is more a function of other factors than of whether or not the structures are grounded. In the case of lines with ungrounded structures, in many instances, the guy wires in practical effect convert the structure into a grounded structure. This one point is to a considerable degree responsible for the fact that very little difference in performance is ordinarily obtained between lines of the lower voltage classes in comparing lines with grounded and ungrounded supports.

My conclusion, therefore, is that these figures do not give a comparison of the inherent difference in performance between lines which are grounded and lines which are not grounded, and that it is necessary to go much further than the matter of grounding supports in order to determine what the factors are which govern the lightning performance of such lines as they are ordinarily constructed.

F. E. ANDREWS,
Engineer Electrical Distribution.
Public Service Company of Northern Illinois,
Chicago.

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Priority of Loads in Emergencies

To the Editor of the ELECTRICAL WORLD:

P. B. Juhnke's remarks in the Dec. 13, 1930, issue of ELECTRICAL WORLD relative to the dumping of load when essential generating capacity is lost are entirely to the point. As he points out, the Edison direct-current network load is held on at all costs for *technical* reasons, namely, that it is so hard to start again.

The Union Gas & Electric Company load dispatchers have carefully written instructions for load dumping. These instructions comprise schedules, each schedule taking care of, say, a 10,000-kw. dump. The schedules, starting with No. 1, give the order in which load should be dumped. The schedules are quite simple, merely giving opposite the number of the schedule the numbers of the substations and stations involved in that load dump. For instance, if the dispatcher finds the system, due to some catastrophe, suddenly 30,000 kw. short on generating capacity, he will call stations Nos. 3, 12, 6 and 8 and tell them to dump load per schedule No. 3. The station operators, in turn, will open the various radial circuits called for in their dump load schedules. If this does not afford enough relief the load dispatcher will call the stations involved in the next higher numbered load-dumping schedule.

By employing load-dumping schedules it is possible to maintain service to certain very important circuits feeding hospitals and the alternating-current network, which would be lost should all radial load other than the Edison system be dumped.

Although the Union Gas & Electric Company Edison system load is only one-quarter the size of the Commonwealth Edison's, the technical difficulties in starting it from a dead condition are similar. This direct-current system has not suffered a total shutdown for 25 years, nevertheless all the direct-current station operators and load dispatchers are carefully drilled in the method of emergency starting from a total shutdown. The method is, briefly, to bring up to speed the various rotary converters involved with a separate turbo-generator disconnected from the rest of the system. The rotary converters are connected to the Edison system from the start of the operation, so no current rush will occur and no machine will hog the load. This method has the advantage of being comparatively rapid and does not involve cutting the network into sections.

S. M. HAMILL, JR.,
Assistant Superintendent Electrical Operating Department.
Union Gas & Electric Company,
Cincinnati, Ohio.

Men of the Industry

G. O. Muhlfeld New President of Stone & Webster

GEORGE O. MUHLFELD, who was elected president of Stone & Webster, Inc., as announced in the December 20 issue of the ELECTRICAL WORLD, has been identified with that organization for 30 years. The range of his undertakings during this period of time places him in the front ranks of leaders in the investment banking, utility, engineering and construction fields. Mr. Muhlfeld served successively as surveyor, foreman, superintendent, construction manager, vice-president and president of the Stone

& Webster Engineering Corporation and senior vice-president and a member of the executive committee of Stone & Webster. He is also a director of many large and important corporations with which Stone & Webster has no connection, as well as of all of Stone & Webster's important subsidiaries.

Mr. Muhlfeld after studying engineering at Purdue and Cornell entered upon the first step of his business career as a contractor in Peru, Ind., his native city, in 1895. It was not long before he was active in construction work in fields far from home, and we soon find him in the far northwest as an employee of Stone & Webster on one of their earlier hydro-electric developments. He was given greater responsibilities as time went on.

More than twelve years ago he assumed the direction of most of the important engineering and construction work carried on by Stone & Webster, Conowingo, Rock Island, Osage. In fact, all the greater recent hydro-electric developments, as well as large industrial plants, show the handiwork of Mr. Muhlfeld. It is, however, in the financial field that his greatest success has been made. For ten years, in the increasing interest that Stone & Webster has been taking in financial and banking undertakings, he has played a prominent part. He has been instrumental or intimately associated with the formation of important public utility companies, banking and security corporations, and other organizations.

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ANDREW J. MALONEY, president of the Philadelphia & Reading Coal & Iron Company, has been elected a director of the National Power & Light Company. The election of Mr. Maloney to the board of the utility company follows the recent sale by the coal company of its power plants and facilities to the Pennsylvania Power & Light Company, a subsidiary of the National Power & Light Company.

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HOWARD C. FOSS, president of the Savannah Electric & Power Company, will be awarded the Lucas trophy for 1930, an annual award for the most meritorious service rendered the city of Savannah by one of its citizens. Mr. Foss was chosen by the committee, it has been announced, because of his efforts in securing two major industries —the Southern Building Products Corporation and the Mexican Petroleum Corporation of Georgia. Mr. Foss during the past year has served as chairman of the Industrial Commission of Savannah.

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FLOYD B. ODLUM, vice-president of the Electric Bond & Share Company, has been elected to the vice-presidency of the American Arbitration Association for New York at a recent meeting of the directors. In addition to being a vice-president of the Electric Bond & Share Company, he is a vice-president of the National Power & Light Company, vice-chairman of the board of the American & Foreign Power Company, president of the Atlas Utilities Corporation and a director of numerous other companies. He has been engaged in financial work since 1921, when he gave up the practice of law. Mr. Odlum has just returned from a five months' trip abroad, during which he made a study of conditions in several European countries and carried on special negotiations on behalf of the companies with which he is affiliated.

W. H. Onken Assumes New Executive Duties

WILLIAM H. ONKEN, JR., former editor of the ELECTRICAL WORLD and for years an outstanding figure in the electrical industry, has just been appointed vice-president of the Security Owners' Association, with headquarters in New York City. This association was formed in 1917 as the National Association of Owners of Railroad and Public Utility Securities. Its primary functions are to safeguard honest and legitimate investments made in utility properties and to afford a medium for collective

action by owners of securities for the purpose of maintaining and improving the credit of the corporations issuing them.

Mr. Onken, as old-time readers of the ELECTRICAL WORLD do not need to be told, brings to his new executive post an unusually broad background of knowledge and experience in the public utility field. His thirty years' service in electrical journalism involved not only a vast amount of editorial writing of a policy-shaping kind but also a remarkably wide acquaintanceship, often intimate in its nature, with executives and engineers, including all the outstanding figures in the American field and many of those abroad. His duties took him to every corner of North America and several times to Europe. Studying for so long a period the expansion of the electrical industry from week to week, he came to speak on its affairs with almost encyclopedic knowledge and much authority, and he responded ably and with enthusiasm to constant invitations to address state and

national bodies on its history and philosophy, to contribute articles and interviews to outside periodicals and to help guide the formulation of public and legislative policies.

Mr. Onken's first newspaper work was with the New York *Evening Post*. This he relinquished to take a course in electrical engineering at the Brooklyn Polytechnic Institute. He joined the *American Electrician* in 1900, and in 1906, when that paper, a monthly, was consolidated with the ELECTRICAL WORLD, he became an associate editor of the latter, subsequently becoming managing editor, then editor and finally senior editor. From the last post he retired a year ago.

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G. O. Smith Heads Federal Power Commission

GEORGE OTIS SMITH, who was recently sworn in as chairman of the Federal Power Commission, as announced in the December 27 issue of the ELECTRICAL WORLD, has been director of the U. S. Geological Survey since 1907, with the exception of the year 1922-1923, which he spent as a member of the U. S. Coal Commission. Doctor Smith was born in Hodgdon, Me., and received his education at Colby College, Johns Hopkins University and the Case School of Applied Science. From 1893 to 1906 he engaged in geological work in Michigan,

Utah and Washington, and later in Alaska.

It was in 1896 that he first became identified with the U. S. Geological Survey as assistant geologist, subsequently being made geologist and finally director. Doctor Smith is the author of reports on areal, economic and physiographic geology and also of papers and addresses on economics of mineral and power resources. He is a fellow of the Geological Society of America and of the American Association for the Advancement of Science, as well as a member of the American Institute of Mining and Metallurgical Engineers, of which he is a past-president, and of similar associations.

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W. H. Fischer Vice-President of California Utility

WILL H. FISCHER, who has been associated with the Southern California Edison Company, Ltd., since 1921 as assistant vice-president and later as assistant to the president, was elected vice-president in charge of public relations at a recent meeting of the board of directors. Mr. Fischer was born in Yolo County, California, and upon completion of his education engaged in newspaper work, serving in various capacities with papers in San Francisco and Los Angeles, as well as with papers in some of the smaller cities of California.

R. H. Ballard, president of the Edison

company, in announcing the election of Mr. Fischer said: "Mr. Fischer's host of friends throughout the state appreciate his qualities, which have appealed to us during his nearly ten years of association with us and which fit him in every way for this important office."

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OBITUARY

Edward G. Connette

EDWARD G. CONNETTE, who had been prominent in the public utility field in New York for the last 30 years, died at the home of his son, Thomas W. Connette, in Lockport, N. Y., December 30. Mr. Connette was formerly president of the International Railway Company and of the United Gas & Electric Company and more recently he had been connected with the Associated Gas & Electric Company with offices in New York City. In addition he was an officer and director of numerous light, heat, power and street railway companies, a number of which are affiliated with the United Gas & Electric Corporation. His early experience was in the transportation field, at first with the Louisville, Cincinnati & Lexington Railroad, later known as the Louisville & Nashville Railroad, and subsequently with the street railways in Nashville. In 1897 he was made chief engineer of the Cumberland Electric Light & Power Company.

After serving in an executive capacity with the Syracuse Rapid Transit Company and the Worcester Consolidated Street Railroad and its subsidiary companies Mr. Connette became, in 1909, transportation engineer for the Public Service Commission, the position from which he resigned in 1912. At that time he became associated with the International Railway Company of Buffalo, leaving it in 1915 to join the electric companies with which he was thereafter associated. At the time of his death Mr. Connette was president and a director of the Elmira Water, Light & Railroad Company, a director of the International Power & Transmission Company of Lockport, president and director of the Lockport Light, Heat & Power Company, a director of the West Water Street Railway Company of Elmira, a director of the Schenectady Railway Company, president and a director of the 840 Park Avenue Corporation and a director of the Crown Central Petroleum Corporation.

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ALLAN CHANTLER, assistant secretary of the Electrical Association of New York, dropped dead, December 24. Mr. Chantler had been identified with the Electrical Association and predecessor associations for a number of years.

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GEORGE L. ARNOLD, since 1923 purchasing agent for the El Paso Electric Company, El Paso, Tex., died December 16 at the age of 40, following a brief illness. He was a veteran in the service of the power company, having been employed by it in various capacities since 1909.

Financial and Statistical News

UTILITY holding company stocks have been deflated considerably more than those of operating companies. At the price peak many holding company stocks were as high as 35 times earnings and a representative group now averages thirteen times earnings. Few operating company stocks went as high as 30 times earnings and a typical group is now fifteen times.

——MARKET OPERATIONS CONTINUE TO REFLECT HESITANCY in any general advance, but there is ample support on selling movements. Utility stocks show a gain of a few points during the week.

——PUBLIC UTILITY BONDS CONTINUE QUITE FIRM, with a few advances. New issues have been negligible since early in December, but several are shaped up awaiting satisfactory market conditions. It is again rumored that the $50,000,000 Columbia Gas & Electric issue will be offered shortly.

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Public Utility Issues Added to Legal List

THE ANNUAL REVISED LIST of securities which are legal investments for savings banks in the state of New York has just been made public by Joseph A. Broderick, State Superintendent of Banks. Several public utility issues were added to the list and none was dropped. Those added include the following:

Consolidated Gas, Electric Light & Power Company of Baltimore, first refunding 4½s of 1970, series H. Nassau & Suffolk Lighting Company, first 5s of 1945. New Jersey Power & Light Company, first 4½s of 1960. New York State Electric & Gas Corporation, first 3¾s of 1931 and first 4½s of 1980. Penn Public Service Corporation, first and refunding 6s of 1947, series C, and first and refunding 5s of 1954, series D. Pennsylvania Electric Company, first and refunding 4½s of 1970, series E.

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United Founders Controls United States Electric Power

UNITED FOUNDERS CORPORATION has strengthened its relations with the utility industry by acquisition of control of United States Electric Power Corporation. Additional common and class A stock sufficient to carry voting control was presumably purchased either in the open market or privately.

Some time ago United States Electric Power Corporation came into prominence in connection with the change in Standard Gas control. United States Electric, jointly with H. M. Byllesby & Company, the latter through Standard Power & Light Corporation, acquired control of the Standard Gas & Electric system, with assets of over $1,100,000,000.

United States Electric Corporation was launched in September, 1929, and has an international character. Hydro-Electric Securities Corporation, which is sponsored by the J. Henry Schroder banking companies of New York and London, as well as leading Belgian, French, British and Canadian banking groups, is heavily interested. United Founders and Hydro-Electric Securities Corporation together are estimated to hold over 75 per cent of the voting control of United States Electric and the former owns probably over 52 per cent. The balance, excepting the floating supply in the market, is owned by various members of the banking group which launched United States Electric Power Corporation. They are:

Albert Emanuel Company, Inc.; W. C. Langley & Company; A. C. Allyn & Company, Inc.; Harris, Forbes & Company; J. Henry Schroder Banking Corporation; Chase Securities Corporation; Société Générale de Belgique, Brussels; J. Henry Schroder & Company, London, and the Koppers Company of Pittsburgh.

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Another Hundred Million Going Into Budgets

A CONSTRUCTION budget of $48,167,300 has been adopted for 1931 by the electric companies in the New York Edison System, Matthew S. Sloan announced this week. That sum is apportioned by companies as follows:

New York Edison Company	$5,520,100
Brooklyn Edison Company	20,435,000
United Electric Light & Power Company	6,329,200
New York & Queens Electric Light & Power Company	15,111,000
Yonkers Electric Light & Power Company	772,000

The budget contains items for generating stations, $11,409,200; substations, $652,600; buildings and yards, $142,000; transmission and distribution, $35,148,200; miscellaneous, $815,300. Of the expenditures for generating stations, $426,000 will be for structures and equipment at the East River station of the New York Edison Company, $1,833,200 for equipment at the Hell Gate station of the United Electric Light & Power Company and $8,711,000 for the Hudson Avenue station of the Brooklyn Edison Company, of which sum $8,290,000 is for two 160,000-kw. turbo-generators to go into service this year and next.

The largest item in the budget, $35,148,200, will be expended for improving the distribution systems of the companies, and particularly for removing overhead pole lines in Brooklyn and Queens.

"Our construction budget for 1931 is smaller than that for 1930 by approximately $28,000,000," said Mr. Sloan. "That is because we are now built well ahead on generating plant capacity, especially since the demand for current during 1930 did not increase at its normal rate. Our chief activity this year will be enlarging the capacity of our distribution system and generally improving it. We have provided for an extensive program of changing overhead lines to underground, which will yield a more reliable service and vastly improve the appearance of the streets and benefit property in those sections where the lines are placed undrground."

Niagara Hudson appropriations

Announcement of a $30,000,000 construction program for improving service facilities in New York State during 1931 was made last week by the Niagara Hudson Power Corporation. This new appropriation is in addition to the $45,000,000 spent for construction during 1930.

Last year the Niagara Hudson system carried out a very extensive program of expansion and improvement. Major projects included adding 57,000 hp. to the capacity of Spier Falls hydro-electric station on the upper Hudson and 207,000 hp. to the capacity of Huntley steam-electric station at Buffalo.

Companies of the system were particularly active in building rural lines. During 1930, 859 miles of rural lines were built, adding 3,769 new farm customers.

The budget provides appropriations totaling $21,300,000 for the building of transmission and distribution lines and substations. Hydro-electric plant construction is allotted $4,165,000 and steam $2,700,000.

Gas and electric subsidiary companies of the United Gas Improvement Company will spend $31,227,000 for additions and improvements to their properties in 1931, according to John E. Zimmermann, United Gas Improvement president.

This amount, he announced, is less in total than was spent by the United Gas Improvemet system companies in 1930, when an unusual expenditure for a large power plant and a high-tension transmission line was made, but, excluding these items, the amount to be spent in 1931 is practically the same as was expended last year. The projects included in the budgets will be pushed forward as rapidly as possible in order to take advantage of present low costs of materials and to help to relieve unemployment.

"United Gas Improvement properties," Mr. Zimmermann stated, "despite the recession in business, show gains for the year in both gas and electric sales and no attempt has been made to curtail the budgets due to present business conditions."

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CURRENT EARNINGS REPORTS OF ELECTRIC LIGHT AND POWER COMPANIES

OPERATING COMPANIES

	1930	1929	Per Cent Increase	Operating Ratio 1930	Operating Ratio 1929
Alabama Power* (Year ended November 30)					
Gross earnings	$17,983,961	$18,311,508	—1.8	42	37
Net earnings	10,334,769	11,466,758	—9.9	..	..
Carolina Power & Light (Year ended October 31)					
Gross earnings	8,949,747	9,388,222	—5.0	44	46
Net earnings	4,998,507	5,085,867	—2.0	..	..
Consumers Power (Year ended November 30)					
Gross earnings	32,553,619	33,379,414	—2.5	45	49
Net earnings	17,715,674	16,947,850	4.5	..	..
Dallas Power & Light (Year ended October 31)					
Gross earnings	5,329,934	5,145,014	4.0	47	46
Net earnings	2,805,055	2,797,257	0.0	..	..
Detroit Edison (Year ended November 30)					
Gross earnings	53,949,042	56,534,265	—4.6	68	66
Net earnings	17,256,955	19,113,681	—9.7	..	..
Georgia Power† (Year ended November 30)					
Gross earnings	24,653,684	23,668,749	4.2	50	47
Net earnings	12,253,794	12,523,033	—2.1	..	..
Iouston Lighting & Power (Year ended October 31)					
Gross earnings	8,798,005	7,814,613	13.0	52	53
Net earnings	4,223,657	3,673,935	15.0	..	..
Kansas City Power & Light (Year ended November 30)					
Gross earnings	14,742,885	14,559,471	1.2	48	51
Net earnings	7,609,597	7,151,908	6.4	..	..
Kansas Gas & Electric (Year ended October 31)					
Gross earnings	6,025,555	5,759,974	5.0	52	52
Net earnings	2,866,839	2,730,020	5.0	..	..
Louisvi.le Gas & Electric (Year ended October 31)					
Gross earnings	10,545,168	10,202,201	3.3	..	..
Net earnings	5,368,125	5,296,522	1.3	..	..
Memphis Power & Light (Year ended October 31)					
Gross earnings	6,739,530	6,036,035	12.0	59	60
Net earnings	2,759,662	2,389,634	15.0	..	..
Minnesota Power & Light (Year ended October 31)					
Gross earnings	6,486,797	6,193,021	5.0	39	36
Net earnings	3,956,685	3,955,613	0.0	..	..
Nebraska Power (Year ended October 31)					
Gross earnings	6,509,506	5,902,166	10.0	49	51
Net earnings	3,311,941	2,903,912	14.0	..	..
New Orleans Public Service (Year ended October 31)					
Gross earnings	17,474,591	16,174,937	8.0	64	64
Net earnings	6,307,563	5,831,351	8.0	..	..
Northern States Power (Year ended October 31)					
Gross earnings	33,181,691	32,531,191	2.0	..	..
Net earnings	16,408,228	16,628,313	—1.3	..	..
Ohio Edison (Year ended November 30)					
Gross earnings	19,233,870	19,355,552	—0.6	39	43
Net earnings	11,643,657	11,120,782	4.7	..	..
Oklahoma Gas & Electric (Year ended October 31)					
Gross earnings	14,669,987	13,948,344	0.8	..	..
Net earnings	6,970,795	6,532,291	6.7	..	..
Pennsylvania Power & Light (Year ended October 31)					
Gross earnings	30,880,068	30,003,318	3.0	49	50
Net earnings	15,692,631	14,936,823	5.0	..	..
San Diego Consolidated Gas & Electric (Year ended October 31)					
Gross earnings	7,357,588	7,327,573	0.4	..	..
Net earnings	3,667,817	3,486,118	5.2	..	..
Southern California Edison (Year ended November 30)					
Gross earnings	41,127,825	39,925,805	3.0	32	33
Net earnings	27,887,091	26,499,237	5.0	..	..
Tennessee Electric Power (Year ended November 30)					
Gross earnings	14,983,473	14,552,073	2.9	52	52
Net earnings	7,150,592	7,097,629	0.7	..	..
Texas Power & Light (Year ended October 31)					
Gross earnings	9,966,601	9,833,285	1.0	48	51
Net earnings	5,136,355	4,847,677	6.0	..	..
Utah Power & Light (Year ended October 31)					
Gross earnings	11,454,482	11,665,346	—2.0	51	51
Net earnings	5,594,495	5,792,379	—3.0	..	..
Wisconsin Public Service (Year ended October 31)					
Gross earnings	5,634,377	5,407,115	4.2	..	..
Net earnings	2,371,068	2,326,820	1.9	..	..

HOLDING COMPANIES

	1930	1929	Per Cent Increase	Operating Ratio 1930	Operating Ratio 1929
American Commonwealths Power & affil. cos. (Year ended November 30)					
Gross earnings	$27,899,635	$24,721,431	12.8	52	56
Net earnings	13,298,091	10,879,146	22.4	..	..
American Water Works & Electric & subs. (Year ended October 31)					
Gross earnings	54,654,134	53,645,659	1.8	50	50
Net earnings	27,041,327	26,613,511	1.6	..	..
Associated Gas & Electric System‡ (Year ended November 30)					
Gross earnings	110,960,292	85,826,042	29.0	52	52
Net earnings	53,331,037	41,703,753	27.8	..	..
Cities Service (Year ended November 30)					
Gross earnings	61,182,448	42,948,476	42.4	..	..
Net earnings	58,781,453	41,650,882	41.1	..	..
Commonwealth & Southern & subs. (Year ended November 30)					
Gross earnings	142,397,897	147,003,575	—8.1	49	49
Net earnings	72,621,889	75,256,819	—3.5	..	..
Federal Light & Traction & subs. (Year ended October 31)					
Gross earnings	8,536,907	8,441,186	1.1	56	59
Net earnings	3,710,394	3,432,517	8.1	..	..
Philadelphia Co. & subs. (Year ended October 31)					
Gross earnings	62,209,099	63,265,831	—1.7	..	..
Net earnings	30,349,875	30,840,040	—1.6	..	..
Public Service of New Jersey & subs. (Year ended November 30)					
Gross earnings	138,507,734	136,233,125	1.7	69	69
Net earnings§	42,915,865	41,897,124	2.4	..	..
Standard Gas & Electric & subs. & affil. cos. (Year ended October 31)					
Gross earnings	154,375,938	152,970,313	0.9	..	..
Net earnings	73,854,359	73,037,865	1.1	..	..

*Figures for 1929 include operation of gas properties sold May 1, 1929.
†Figures for 1929 include operations of gas properties sold May 1, 1929. Operations of Columbus Electric & Power Company included from May 1, 1930.
‡Since dates of acquisition (actual).
§Operating expenses include depreciation.

Various Grades of Bonds Show Wider Yield Disparity

By C. W. SILLS

Vice-President Halsey, Stuart & Company

THE bond market of 1930 was decidedly one-sided. Bonds of the so-called gilt-edge variety were in strong demand throughout the greater part of the year, and in September advanced to the highest price levels seen since the early months of 1928. Since September, however, the market on high-grade issues was on the decline, and midway through December a large part of the advance made earlier in the year was wiped out. The decline was mainly due to heavy liquidation, much of it coming from banks and a good deal also from individuals.

The less widely recognized bonds not only failed to make gains during the year corresponding to those made by the gilt-edge issues, but as the year drew to a close were actually selling at lower levels than those which prevailed last January.

A significant feature of the market, and one which investors will do well to consider carefully, is the wide disparity which has existed between the yields offered by sound bonds of these two different classes. The income offered by scores of the sound but less widely recognized issues is farther out of line with that offered by the highest grade issues than was true back in 1920-1921. And the post-war period, of course, has generally been looked upon during the greater part of the past decade as an era of unusual opportunity in the bond market.

High-grade public utility bonds have resumed their customary place in public utility financing programs and enjoyed special investment favor throughout the year. The sustained demand for high-grade public utility bonds is largely accounted for by the excellent records which the industry as a whole has been able to make in the face of depressed conditions. Indications are, as this is written, that both the leading power and light companies and the leading gas companies will show net earnings for 1930 which will compare quite favorably with those of 1929, and in some cases there may even be a small margin of improvement over last year.

Holding company issues

A related group of securities which recommends itself for special attention consists of the bonds and notes of public utility holding companies and utility investment companies. Securities of these types were brought out in considerable volume during 1929, and, to adapt them to the demand existing at that time, many issues carried warrants or conversion features. The result was that much of this financing fell into speculative hands, and, with the decline of speculative interest, came back into the market much faster than it could find its way into sound investment channels. Many issues of these types sold throughout the year at prices which were obviously much out of line with the value of the bonds, considered strictly as investment. The values offered among securities of this class have been in striking contrast with those available among the higher grade industrial issues.

Dividend Announcements

Directors of the National Public Service Corporation declared a special dividend of 60 cents per share on the class B common stock, payable January 15 to holders of record December 31, in addition to the regular dividends for the year of $1.60 per share.

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A special dividend for the year of 40 cents per share has been declared by the directors of the Seaboard Public Service Company on the 600,000 outstanding shares of no-par value common stock, payable December 29, 1930, to holders of record December 26. This special disbursement is in addition to the regular quarterly dividends for the year of $2 per share.

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Directors of the Southern Berkshire Power & Electric Company have voted to omit the quarterly dividend ordinarily payable about January 10 on the common stock. Previously quarterly disbursements of 75 cents per share were made on this issue.

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New Hampshire Utility Issues Bonds

FIRST AND REFUNDING mortgage 4½ per cent gold bonds, series B, of the Public Service Company of New Hampshire have been offered during the week ended January 8, a piece of financing involving a total of $1,000,000. The offering price was 96 and interest to yield over 4.76 per cent. These bonds are secured by a direct first mortgage on all the company's physical property, the book value of which is $25,291,937. Proceeds of this issue will be used to reimburse the company for purchase of property, for extensions to plant and equipment already completed, and for other corporate purposes.

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NEW SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN DECEMBER

Name of Company	Amount of Issue (Par Value)	Period (Years)	Class	Purpose	Interest Rate	Price	Per Cent Yield
Toledo Light & Power Co.	$35,000,000	2	Secured gold notes	To purchase certain securities, to pay certain indebtedness, to increase working capital and for other corporate purposes	5	99½	5.25
West Texas Utilities Co.	3,750,000	27	First mortgage gold bonds, series A	To reimburse treasury for costs of extensions and additions to its property	5	89¼	5.75
Virginia Public Service Co.	6,000,000	20	First mortgage and refunding gold bonds, series B.	To reimburse the treasury for recent additions and betterments to the property and for other corporate purposes	5	90	5.85
Androscoggin Electric Co.	873,500	4	First and refunding mortgage gold bonds		5	98¼	5.50
Central West Public Service Co.	300,000	26	First lien collateral gold bonds, series B	To reimburse treasury for cost of purchased property, additions and extensions, and for other corporate purposes	5½	92	6.11
San Diego Consolidated Gas & Electric Co.	1,500,000	1	Notes	To retire current indebtedness and to reimburse the company in part for extensions and additions	4	99½	4.55
Total	$47,423,500			Rights			
Total amount actually realized	46,217,339			Total financing for December	$46,217,339		

Business News and Markets

Leipzig Trade Fair Will Be Held in March

THE LEIPZIG FAIR, catering to the extension of world trade for more than 100 years, will be held during the first week of March.

The spring fair will comprise 10,000 exhibits, assembled from 22 countries, thus, it is claimed, constituting the largest and most varied market in the world. The exhibits of similar merchandise will be displayed in the same or closely grouped buildings. The visiting buyers at Leipzig find it possible to shop through a score of countries quickly and economically. An American exhibitor last year found that with an expenditure of six days' time and $2,000 he accomplished more than by a four months' trip through Europe and an outlay of ten times the amount spent to exhibit.

An attendance of some 200,000 buyers is assured at the spring fair, including 30,000 from foreign countries. The United States will send more than 100 characteristic exhibits and upward of 2,000 buyers from all parts of the country. A special American headquarters will be established and every facility offered for transacting business.

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Section Chairmen Appointed by N. E. M. A.

OTHER NEWLY ELECTED OFFICERS of the National Electrical Manufacturers' Association include the following section chairmen:

Fire alarm group—C. C. Skiles, Autocall Company. Telephone group—A. T. Morrison, S. H. Couch Company, Inc. Visual and code signal systems group—George J. Rick, Holtzer-Cabot Electric Company. Small air circuit breaker section—C. A. Bates, Bryant Electric Company. Snap switch section—O. H. Van Amburg, General Electric Company.

Street lighting section—L. A. S. Wood, Westinghouse Electric & Manufacturing Company. Switchgear section—R. A. Neal, Westinghouse Electric & Manufacturing Company. Power switchboard group—F. W. Paterson, General Electric Company. Oil circuit breaker group, A. C. Streamer, Westinghouse Electric & Manufacturing Company. Power switching equipment group—J. S. Lawson, Memco Engineering & Manufacturing Company. High-voltage fuse group—H. H. Rudd, Railway & Industrial Engineering Company.

Large air circuit breaker group—E. Swift Newton, I.T.E. Circuit Breaker Company. Transformer section—L. R. Brown, General Electric Company. Wire and cable section (rubber-covered wire group)—Wylie Brown, National Electric Products Corporation. Wiring devices division—G. E. Hunt, Cutler Hammer, Inc

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Lamp Sales in 1930

A PRELIMINARY ESTIMATE of the number of incandescent lamps sold in the United States during 1930 indicates a total of 563,778,000 for both large and miniature lamps, according to the review of the electrical industry by John Liston in the *General Electric Review* for January.

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Electrical Merchandise Sales Down 8.5 per Cent

SALES OF ELECTRICAL MERCHANDISE declined 8½ per cent to $789,634,625 last year. Totals based on records and estimates for the past two years are given in the following table:

	1929		1930	
	Number Sold	Retail Value	Number Sold	Retail Value
Cleaners, vacuum	1,253,202	$62,600,000	978,106	$53,795,830
Clocks, household	350,000	7,000,000	1,200,000	15,155,000
Cookers (600 watts or less)	150,000	1,125,000	145,000	985,000
Cookers, egg	82,500	442,200	58,500	351,000
Dishwashers	12,000	2,400,000	15,000	3,000,000
Fans:				
Ceiling	74,000	3,375,000	68,000	3,094,000
Desk and bracket	673,000	9,422,000	819,000	11,466,000
Ventilating, household	34,000	1,073,720	29,000	914,950
Fixtures, Lighting:				
Residential	.....	47,000,000	.....	35,260,000
Commercial	.....	21,107,000	.....	15,800,000
Flashlights:				
Cases	7,350,000	7,340,000	7,000,000	5,250,000
Battery cells	135,000,000	13,500,000	125,000,000	12,500,000
Floor machines, household	53,000	2,514,000	32,500	1,832,000
Heaters and radiators	303,000	1,893,750	242,400	1,151,440
Heating pads	637,500	3,506,250	433,500	2,805,000
Hot plates, stoves and grills	347,000	2,010,000	270,660	1,587,900
Ironing machines	126,000	9,637,000	100,000	7,600,000
Irons	3,150,000	14,438,000	2,362,500	10,867,500
Lamps, Incandescent:				
Residential	160,000,000	54,000,000	180,000,000	56,000,000
Commercial and industrial	195,000,000	65,300,000	173,800,000	61,000,000
Miniature	278,430,000	51,093,000	233,950,000	38,860,000
Lamps and shades, portable	7,280,000	38,820,000	.....	30,000,000
Oil burners, domestic, motor-driven	99,700	64,800,000	101,000	63,700,000
Percolators:				
Aluminum	800,000	3,400,000	450,000	1,450,000
Copper plated	495,800	6,941,200	406,500	5,182,875
Ranges:				
Regular	158,000	26,070,000	180,000	27,000,000
Wall outlet	20,000	1,200,000	10,000	600,000
Refrigerators	630,000	181,175,000	775,000	197,625,000
Sewing machines	399,000	36,750,000	319,000	28,728,000
Toasters	1,540,000	8,531,000	1,263,000	6,946,500
Waffle irons	768,000	6,528,000	683,500	5,317,630
Washing machines	956,000	107,900,000	802,000	83,809,000
Totals	.....	**$862,832,120**	.....	**$789,634,625**

These figures are compiled by *Electrical Merchandising* from sales records of associations and manufacturers and from estimates made by association executives and leading manufacturers.

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Wholesalers Study Cost of Distribution

APPRECIATING ITS ECONOMIC responsibility in the field of distribution, the National Electrical Wholesalers' Association is constantly advocating means to reduce the cost of this necessary function. A committee composed of the National Associations of Wholesale Grocers, Wholesale Dry Goods and the National Electrical Wholesalers' Association has secured the active aid of the policyholders' service bureau of the Metropolitan Life Insurance Company in conducting a survey to adjust their business to changing conditions.

Budgetary control is a comparatively new device available to business executives. An objective of this survey will be complete elucidation of budgetary control and its administrative function and value. Balancing expenses against income is the goal of a well-organized budget. Instead of rigidly defined limits, an operating budget should be the caliper for measuring the business progress.

Expert technicians have been assigned to this survey by the policyholders' service bureau. It is conceivable

that, with proper co-operation from the members of the three associations acting as sponsors, the information developed by this research will be of value in helping all wholesalers to adjust their business to changing conditions.

Two meetings of this committee have been held, and the actual work on the survey is in progress. No delays are expected and with whole-hearted co-operation a successful and speedy study is apparent. The results of the survey and the recommendations to be added will be graded so that size or scope of a business is immaterial. Real, cogent material will be made available to wholesalers, and those taking advantage of it should lower their cost of distribution by virtue of control of its vital factors.

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Washing Machine Prices Break

AT A TIME when many washing machine producers were already suffering from loss of sales volume and reduced income, the appearance of a $79.50 machine by a New York State company has precipitated something of a crisis in the industry. A steady decline in retail prices has brought washers from $165 on the average in 1928 to around $100 now, due largely to department store retail sales. They were expected to remain at this price as it was considered impossible to sell a high quality machine at a lower price than this.

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N.E.M.A. Midwinter Meetings

AT THE MONDAY, January 19, session of the National Electrical Manufacturers' Association midwinter meeting the following divisions and groups will hold sessions: Wiring devices and technical committee, wiring materials divisions, electric measuring instrument, small air circuit breaker and surface raceway sections, also flexible cord group and law and legislative committee.

On Tuesday carbon, electrical porcelain, fuse, non-metallic conduit, non-metallic sheathed cable, high-voltage insulator, overhead trolley line materials, and panelboard and distribution board sections will meet, also the metal reflector group and board of governors.

On Wednesday heating appliance, knife and enclosed switch, attachment plug, lamp receptacle and socket, manufactured electrical mica, street lighting, floodlighting, snap switch and rigid conduit sections. Also magnet wire, rubber-covered wire, power cable groups, automobile and radio wire sub-group.

On Thursday wiring materials division, armored conductor and metallic flexible conduit and vulcanized fiber sections and standards committee.

On Friday laminated phenolic products and transformer sections, also casualty and fire prevention committee.

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New Engineering and Contracting Firm

A NEW ENGINEERING and contracting firm know as the Lummus Company has been organized to take over the business of the Walter E. Lummus Company of Boston, Mass. The new company will engage in the design and manufacture of distillation and refining equipment for the alcohol, chemical and petroleum industries, thus following the lines of activity pursued by the Walter E. Lummus Company, but operating on a larger scale.

The facilities and experience of the Superheater Company and the Babcock & Wilcox Company combined with those of the Lummus organization will, it is claimed by Walter E. Lummus, president of the new company, provide a well-rounded and scientific organization able to cope with many problems in the industries served.

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Copper Price Unchanged

THE SITUATION IN COPPER underwent scarcely any change during the week, business being extremely quiet. The price held at 10½ cents, Connecticut, until Wednesday, when a moderate tonnage sold at 10¼ cents.

	Dec. 31, 1930 Cents per Pound	Jan. 7, 1931 Cents per Pound
Copper, electrolytic	10¼	10¼
Lead, Am. S. & R. price	5.10	4.85
Antimony	7¼	7.30
Nickel, ingot	35	35
Zinc, spots	4.45	4.375
Tin, straits	26¼	27⅜
Aluminum, 99 per cent.	23.30	23.30

Trade Briefs

Diamond Electrical Manufacturing Company has omitted the semi-annual stock dividend of 2 per cent. The regular quarterly dividends of 50 cents on the common and $1.75 on the preferred stocks were declared.

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Canada Wire & Cable Company reports that during 1930 the company's business was larger than in any previous year, showing an increase of 30 per cent over 1929.

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Electrical Engineers Equipment Company announces the appointment of the J. Leo Scanlon Company, 50 Church Street, New York, as its Eastern representative. R. Burnham, who has represented Electrical Engineers Equipment Company in the Eastern territory, has joined the Scanlon organization.

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C. H. Wheeler Manufacturing Company has announced that P. A. Thompson has recently taken charge of its heat transfer equipment division and will be located in Philadelphia.

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Fuller Lehigh Company, a subsidiary of the Babcock & Wilcox Company, will move its manufacturing operations and executive offices from Fullerton, Pa., to Barberton, Ohio, where it will be consolidated with those of the Babcock & Wilcox Company.

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Sales of the Hammond Clock Company for eleven months ended November were approximately four times those of the same period last year, F. H. Redmond, vice-president and general manager, stated.

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Ohio Electric Manufacturing Company, Cleveland, Ohio, announces the appointment of Roland N. Jessop as assistant sales manager.

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DELINQUENT ELECTRICAL ACCOUNTS

(National Electrical Credit Association)

Number of Accounts Reported

Division	November 1929	November 1930	Per Cent Increase or Decrease	11 Months 1929	11 Months 1930	Per Cent Increase or Decrease
New York	229	197	—14.0	2,807	3,069	+ 9.3
Middle & Southern Atlantic	139	126	— 9.3	1,784	1,699	— 4.8
New England	85	97	+14.1	1,417	1,268	—10.5
Central	699	448	—35.9	7,222	7,648	+ 5.9
Total	1,152	868	—24.6	13,230	13,684	+ 3.4

Total Amounts Reported

Division	November 1929	November 1930	Per Cent Increase or Decrease	11 Months 1929	11 Months 1930	Per Cent Increase or Decrease
New York	$53,577	$25,762	—52.0	$533,297	$478,820	—10.2
Middle & Southern Atlantic	20,179	15,587	—22.8	242,692	259,522	+ 6.9
New England	9,113	8,724	— 4.2	198,663	162,070	—18.4
Central	89,626	46,389	—48.2	863,381	966,150	+11.8
Total	$172,495	$96,912	—43.8	$1,838,483	$1,866,562	+ 1.6

Market Conditions

POWER companies are limiting purchases to immediate needs in the Eastern district, but industrial demand continues fair. New England shows some improvement in scheduled materials and inquiries for heavy equipment are increasing. Building activity has increased in the Middle West.

——A DECIDEDLY MORE OPTIMISTIC OUTLOOK seems to be developing on the Pacific Coast and the week's orders, both for heavy equipment and for appliances, are substantial.

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PACIFIC COAST

—THE 1931 FORWARD MARCH *spirit of the electrical industry is typified by the recent mammoth get-together of all its branches in San Francisco. Plenty of work justifies the disappearance of pessimism, and the unemployment situation has been relieved by government, state and municipal work.*

—TWO MILLION DOLLARS' WORTH *of power machinery, mainly heavy pieces, is to be purchased in the very near future in the San Francisco district alone, and annual contracts for poles, both for north and south, are being considered.*

Orders include two 125-hp. motors, valued at $5,000, for a glass company, and a dynamometer outfit valued at $3,500, a $48,300 award for San Diego barracks wiring job, a $6,600 award for the U. S. Hospital in San Francisco and a $66,000 award for traffic signals, cable and accessories for Los Angeles. Actual orders have been rather scarce this past week because of the reaction from annual inventories, but potential business soon to be placed includes: $3,000,000 worth of power construction in Orange County, divided equally between a 15-mile line and a 35,000-hp. substation; a 10,000-kw. station for Monterey; a $350,000 additional government contract for the naval dump at Hawthorne, Nev. Major construction for which bids have been called or are shortly to be called includes a $2,000,000 oil cracking plant at Avon and $5,000,000 worth of construction in San Francisco's civic center, the latter to be divided equally between the war memorial and the opera house; the $5,000,000 plans of the Olympic Club in San Francisco, the first unit of a $2,000,000 Los Angeles terminal warehouse system and San Francisco school construction, including a $1,500,000 high school, a $600,000 junior high and a $400,000 grammar school. An $80,000 order for paper, lead and rubber cable is to be placed soon for power company installation in the Alhambra district of California.

Despite the holiday week, which naturally disrupted the flow of business, Puget Sound and Seattle jobbers report a fair sales volume, the movement being headed by an order to the Bowie Electric Company from the Northwestern Electric Company for about $20,000 worth of disconnecting switches for an aerial project on Lewis River. Other sales included 50 transformers from 10 kw. down, about $2,000 worth of miscellaneous switchgear, 25 motors from 30 hp. down to miscellaneous industrials, 20 from 40 hp. down to mill machinery manufacturers and 30 from 100 hp. down to lumber mills and allied industrials. Bids are being taken by the engineering department of American Can Company, Seattle, for wiring, lighting, etc., in connection with a $1,000,000 plant addition. Mier & Frank department store in Portland expects to award a contract the middle of the month for panelboards, main switchboard with instruments and lighting panels. White River Lumber Company, Enumclaw, Wash., is taking bids for fifteen motors, including three 200-hp. synchronous machines, for a plant addition following the purchase of 55 machines, heretofore reported sold by Westinghouse.

CONSTRUCTION PROJECTS

Pacific Gas & Electric Company, San Francisco, Calif., has authorized construction of a 60,000-volt transmission line from St. Helena to Cordelia, Calif., about 34 miles, with power substation, to cost $188,000; also, extensions and improvements in power substation at Healdsburg, Calif., to cost $35,000, and addition to power substation at Yountville, Calif., to cost $40,000. Metro-Goldwyn-Mayer Studios, Inc., Culver City, Calif., plan film studio to cost $200,000. Southern California Edison Company, Los Angeles, Calif., has authorized fund of $325,000 for extensions and improvements in power substations at a number of places. Backus-Brooks Company, Minneapolis, Minn., contemplates hydro-electric power plant on Cowlitz River, Lewis County, Wash., to cost over $3,000,000.

NEW ENGLAND

—INQUIRIES FOR HEAVY *electrical machinery mark the beginning of the year's business in this district. Activity in turbo-generators is notable, according to one prominent manufacturer, and negotiations are under way for several large units. Hydro-electric projects, on the other hand, are in the main confined to plant additions on a smaller scale; negotiations are under way for a waterwheel unit and plans for other installations in this district are being formulated.*

Small motor sales are steady and in good volume. Control equipment and switches are moving well and the general trend of scheduled materials is stronger than before the beginning of the year. Electric heating sales are spotty. Good activity in small melting furnaces is maintained. Central-station supplies are quiet; merchandising has held up well and one group reports that sales for the past year show an increase over 1930. Electric timepiece sales are steady and outside electric illumination is attracting attention.

CONSTRUCTION PROJECTS

Brownsville Slate Company, Brownsville, Me., contemplates an addition to cost $50,000. Granville Brothers Aircraft Corporation, Springfield, Mass., is reported planning addition to plant to cost over $40,000. Edison Electric Illuminating Company, Boston, Mass., plans addition to power substation at West Medway, Mass., to cost about $150,000. McKesson & Robbins Company, Fairfield, Conn., has completed plans for addition to drug and chemical plant to cost over $100,000.

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SOUTHEAST

—WITH THE COMING *of the new year the tone of business is more optimistic and it is expected that after the inventory period there will be more activity in electrical circles in the Southeast than has been evident for several months past.*

An announcement of unusual interest was made this week covering the immediate construction of a thread mill near Atlanta with an investment of more than $1,500,000. This mill will have 40,000 spindles and will involve the purchase of some $65,000 worth of electrical materials for the plant, a 3,000-kva. substation, and the construction of 1 mile of transmission line. Another interesting industrial project closed last week, also in Georgia, was a clay products plant which will involve 350 hp. in motor load, a 450-kva. substation and the construction of approximately 11 miles of transmission line. A

paper mill in Louisiana ordered last week $25,000 worth of transformers, synchronous motors and control equipment. Contract was let last week on a hosiery mill addition in Georgia and electrical equipment to the extent of $3,500 is being ordered at the present time. Within the next month to six weeks approximately $15,000 in electrical materials will be required on an office building remodeling job in Atlanta, not previously reported. A power company in Tennessee placed an order for oil circuit breakers amounting to $12,000.

CONSTRUCTION PROJECTS

Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until January 20 for one motor-generator set for the Norfolk, Va., navy yard (Schedule 4865). State Board of Education, Richmond, Va., plans industrial college at Petersburg, Va., to cost over $500,000. Columbian Paper Company, Bristol, Va., plans power plant to cost over $90,000. Tennessee Electric Power Company, Nashville, Tenn., plans central substation and local line extensions to cost $100,000.

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SOUTHWEST

—OUT OF ELEVEN *representatives of all branches of the electrical industry interviewed during the past week only one had a really gloomy outlook for the business of 1931. All others predicted a good year, starting slowly, but increasing steadily until about May 15, when the volume would be near normal.*

During the past week the demand for stock sizes of apparatus was about the same as at the first of December. Orders are still small, but increasing contracts reported closed include two 1,100-hp. motors for driving centrifugal pumps, $25,000; two generators, 200 kva., with switchboard and control switches, $6,000, for direct connection to oil engines.

CONSTRUCTION PROJECTS

Union Electric Light & Power Company, St. Louis, Mo., has filed plans for power substation to cost $50,000. St. Louis, Mo., plans nurses' home at city hospital to cost $600,000, and new hospital for negroes to cost $1,200,000. American Railway Express Company, St. Louis, Mo., has plans for a service and garage building to cost $150,000. Construction Quartermaster, Randolph Field, Tex., will receive bids until January 16 for one electric substation. El Paso Electric Company, El Paso, Tex., plans extensions and improvements in power plant to cost $260,000. John Sealy Hospital and State Medical College, Galveston, Tex., plans laboratory to cost $400,000. Louisiana Power & Light Company, Algiers, La., plans transmission line to Olla, Winnfield and vicinity, to cost $125,000.

EASTERN

—ELECTRICAL EQUIPMENT DEMAND *holds to a prospective basis in the Eastern district, with little change since the turn of the new year. Contracts for industrial installations are equaling commitments for central-station account and power companies are limiting immediate purchases to present needs.*

—INQUIRIES HAVE A TENDENCY *to be scattered over a wider range of industrial activity, leading to the general impression that business revival actually has set in. The 1931 budgets of a number of Eastern power interests, now beginning to appear, lend considerable encouragement to the outlook, but just when the buying movement will ensue still remains a question.*

A paper mill in New Jersey has contracted with a New York manufacturer for a turbine unit, paper machine drive, switchboard and accessory equipment to cost $130,000. A manufacturer of washing machines in northern New York has ordered a quantity of fractional-horsepower motors from a state maker, costing about $40,000. The West Virginia Hydro-Electric Company has divided a number of recent orders for equipment for its hydro-electric power project now under way on the Kanawha River, near Boncar, W. Va.; motor and steam turbine drives for pumps, etc., will be furnished by the General Electric Company, Westinghouse Electric & Manufacturing Company, and the Terry Steam Turbine Company; electrical equipment for switchboards, control service and auxiliary use will be supplied by the first two noted companies and the I.T.E. Circuit Breaker Company.

Sizable central station demand in the early future is indicated by some of the appropriations now being arranged for central station expansion. The United Gas Improvement Company will devote an amount of $31,227,000 for such account in 1931, of which close to $18,500,000 will be used by the Philadelphia Electric Company, about $4,600,000 by the Connecticut Electric Service System, and $1,724,000 by the Delaware Electric Power Company. The Niagara Hudson Power Corporation, Buffalo, N. Y., has announced a fund of $30,000,000 for power station, transmission line and distributing system expansion in the coming year. The San Antonio Public Service Company, San Antonio, Tex., will expend an appropriation of $900,000, in the same period.

CONSTRUCTION PROJECTS

Corn Products Refining Company, New York, plans corn sugar refining plant at Pekin, Ill., to cost over $1,000,000, and will make extensions in similar mill at Kansas City, Mo., to cost close to $500,000. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until January 20 for one electric oven and spare parts for Brooklyn, N. Y., navy yard, and for five electric ovens for Mare Island yard (Schedule 4839). Jersey Central Power & Light Company, Asbury Park, N. J., will make extensions and improvements in power station and system at Red Bank, N. J., to cost $390,000. Clark Thread Company, Newark, N. J., plans power plant at proposed mill at Austell, near Atlanta, Ga., entire project to cost $2,000,000. Public Service Electric & Gas Company, Newark, N. J., has plans for a steel tower transmission line in Morris and Sussex Counties, extending to Bushkill, Pa. Penn Central Light & Power Company, Altoona, Pa., contemplates extensions and improvements in recently acquired property of Blain Light, Heat & Power Company, Blain, Pa. Baltimore, Md., contemplates extensions in municipal water system to cost $25,000,000.

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MIDDLE WEST

—A SLIGHT ACCELERATION *in general business was noticeable this week in the Middle West section. A feeling of confidence is being exhibited and the outlook for the coming year is more promising, although not much improvement is looked for during the first quarter of the year.*

—A CONSIDERABLE NUMBER *of favorable indications are being observed. The production of electrical energy increased slightly; railroad purchasing has been resumed on a larger scale, and automotive production is showing an appreciable increase.*

Building construction is improving, electrical apparatus manufacturers are obtaining more business and industrial activity is less spotty. The mild weather has permitted a considerable amount of construction work to be started and as much work as it is possible to start is getting under way. Some of the interesting items placed this week include an order for fourteen electric vehicles to cost approximately $90,000, alterations to present substation, $36,000, and "Mazda" lamps valued at $150,000.

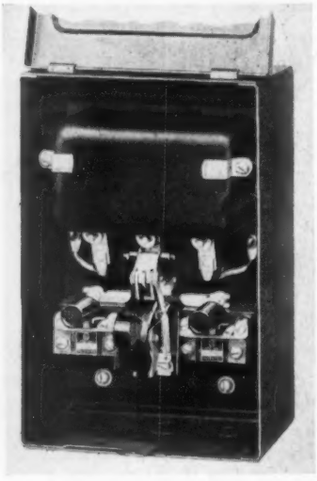
CONSTRUCTION PROJECTS

Wardell Realty Company, Detroit, Mich., plans twenty-story garage building to cost $500,000. Commonwealth Edison Company, Chicago, Ill., has filed plans for power substations to cost about $115,000. Ohio Edison Company, Youngstown, Ohio, will proceed with construction of transmission line early in 1931 from Toronto, Ohio, to East Akron, to cost over $500,000, with substation; also, plans terminal building at Akron to cost $300,000. Procurement Officer, Air Corps, Chanute Field, Rantoul, Ill., will receive bids until January 20 for electrical supplies (Circular 14).

New Equipment Available

Manual Starter Opens All Poles Simultaneously

ONE OF THE FEATURES of the new class 2510 manual starter recently introduced by the Industrial Controller Division, Square D Company, Milwaukee, Wis., is that all poles are simultaneously opened with the tripping of either of the two relays. Another feature of this starter is its trip-free



handle, to prevent blocking of the switch closed against an overload, and as the starter is operated entirely from the front it may be mounted in pairs or groups on pedestal or wall without waste space.

The three-phase ratings of this starter are 5 hp., 220 volts and 7½ hp., 440-550 volts. It is suitable for looms, pumps, portable conveyors, fans and any application where low-voltage protection is not required.

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Welding Torch Extends Use of Electric Arc

A RECENT DEVELOPMENT known as the Hansen arch torch has been announced by the K. L. Hansen Engineering Company, Inc., Milwaukee, Wis. The torch utilizes the current from a d.c. welding generator, the electrodes are specially constructed carbons, the positive electrode is given a peculiar channel shape and has a small aluminum core running through its entire length, and the negative electrode has the usual cylindrical shape, but one end is tapered to a fairly sharp point. With the two carbons mounted in a suitable holder, so that they are inclined at the proper angle, a flame which has been found well adapted to both brazing and welding is projected past the positive electrode.

Because there is no high pressure back of the flame thus produced, and consequently no tendency to blow the metal, operators speak of it as a "soft" flame. The absence of this blowing effect greatly minimizes the convection heat losses, it is claimed. In brazing copper and copper alloys with the Hansen arc torch the same flux is used as when brazing with the oxyacetylene flame.

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Collapsible Door Visor for Outdoor Switch Houses

A COLLAPSIBLE DOOR VISOR for outdoor switch houses which affords protection to the operator and interior equipment when it is necessary to open the doors to inspect or make adjustments during stormy weather is announced by the General Electric Company. The new visor consists of a rectangular piece of sheet steel flanged on all four sides to provide strength and adaptability for mounting. The visor is attached to one

door by means of hinges to facilitate handling and to allow it to drop and lie on the inside of the door when the door is closed. In its service position the visor rests on top of the doors, which are opened 90 deg., and fits snugly against the house.

Explosion-Proof Starter Eliminates Use of Oil

AN AIR-BREAK "explosion-proof" motor starter, known as type E Form AAA, has been announced by the Louis Allis Company, Milwaukee, Wis. Both starter and the motor are built to withstand the force, and prevent the escape,

of flame from any explosion likely to occur inside the apparatus due to grounds, burn-outs, etc., according to the manufacturer. The starter proper consists of the usual across-the-line air-break magnetic contactor with overload and underload protection, but it eliminates the oil used in oil-immersed starters in hazardous areas.

The strength to withstand explosions is provided by a very heavy cast-iron case designed to withstand the worst explosion likely to occur, with an ample factor of safety. The cast-iron cover is held on the case by ten heavy cap screws. Wide machined surfaces and very tight joints between the case and cover cool and prevent the escape of flame even if explosive vapors enter, due to "breathing," and are ignited inside the starter.

Thus approved, the new L. A. 'explosion-proof' motor starter is designed for use in oil refineries, natural gasoline plants, dry cleaning plants, chemical plants, grain elevators, feed mills, or wherever the surrounding atmospheres may be inflammable from the presence of explosive vapors or combustible dust."

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UNDERGROUND CABLE RACKS with insulator supports, as referred to in the December 13 issue of ELECTRICAL WORLD, page 1110, are manufactured by Utilities Service Company, Inc., 913 Hamilton Street, Allentown, Pa., rather than Electrical Utilities Service Company, Inc., as erroneously stated.